MODIFICATION # 3
TO
CONTRACT NUMBER VA-000100-HSMM
BETWEEN THE
COMMONWEALTH OF VIRGINIA
AND
HAYES, SEAY, MATTERN & MATTERN, INC.

This MODIFICATION # 3 is an agreement between the Commonwealth of Virginia through its Department of State Police, hereinafter referred to as "State" or "Commonwealth", and Hayes, Seay, Mattern & Mattern, Inc., hereinafter referred to as "Contractor". This Modification # 3 is hereby incorporated into and made an integral part of the Contract valued at $20,039,388.00.

The purpose of this Modification # 3 is to document the official contractual binding parties and required changes to the Contract as specified in Modification # 2 and further enhanced herein.

Both parties agree to the following:

1. Reference Modification # 1: The signature page of Modification # 1 incorrectly documented the parties to the Contract. As documented in the original contract document, the contracting parties are the Virginia Department of State Police and Hayes, Seay, Mattern and Mattern with the Virginia Department of General Services/Division of Purchases and Supply being the issuing agency. With the change of procurement authority within the Commonwealth from the Department of General Services, Division of Purchases and Supply to the Department of Information Technology, Acquisition Services Division as executed in the Memorandum of Understanding on January 16, 2001, the signature page of this contract Modification # 3 reflects the accurate parties.

2. Reference Page 7, Section II., Paragraph L., entitled “Changes to the Contract”:

   A. Reference Attachment A, entitled “Scope of Services”: Revised Attachment A, Tasks A through R (106 pages) are provided as Attachment A to this Modification # 3. All tasks were not revised. The major changes are delineated below:

      (1) Task C: The number of sites to be visited has increased from 45 to 47. Increase in task of $3,743.00.

      (2) Task D: The base fee includes $42,373.00 that reflects an option, which will only be invoiced if additional proposals are received, requiring a third test, as delineated in D.06. Removing the effect of the third test results in a decrease in the total contract amount by $42,373.00, which will be deleted in a subsequent modification if necessary. Decrease in task of $81,511.00.

(a) D.05 – One technology test has been eliminated, leaving two technology tests. Section replaced with a requirement for investigating financing options.

(b) D.06 – Represents the cost of additional test(s), over three that will reflect an increase of $42,373.00 per test if necessary, requiring a contract modification.

(c) D.11 – Technology assessment report eliminated.

(d) D.101 – Requirement to visit an operational VHF system is deleted.

(3) Task E: Change in the entire philosophy for the Prime Site upgrade and the new Prime Site building has changed from simply describing for an independent design-build team a general description of the upgrade and new buildings, to actual detailed design for the two buildings. The Systems Integrator (SI) will provide the detailed design. Increase in task of $636,739.

(a) E1.01 – Add the requirement for the Contractor to provide design workshops, pre-schematic design, development of specifications, review of the SI design and comment to the COV PM on the new Prime Site building. Contractor will evaluate 2 SI Offeror proposals and participate in negotiations with 2 SI Offerors as well as have three review meetings in Richmond.

(b) E1.02 – Section is changed to have the Contractor develop specifications, review the SI design and comment to the COV PM on the renovation of the existing building.

(c) E1.03 – Section is changed to expand the Contractor's report to include preschematic design of the new Prime Site building.

(d) E1.102 – New sub task that requires the Contractor to provide an upgrade design for the seven VSP communication centers. This includes, functional criteria, survey of the sites, designs specific to each of the seven centers (SI is providing the detailed design), evaluation of SI Offeror responses and three review meetings in Richmond.

(4) Task F: Increase in task of $46,017.00.

(a) F.01 – Contractor will now work with the SI in finalizing the migration plan.

(b) F.02 – The Contractor will review each migration plan update, and work with the Systems Integrator in a series of meetings and review cycles the intent of which is to minimize the impact of migration on each

participating agency, while bringing that agency on line on the system in an expedient manner consistent with the agency's operational situation.

(c) F.101 – New sub task to have the Contractor develop a detailed cutover/migration plan specification based on the F.01 migration plan and also to develop an evaluation process.

(d) F.102 - The requirement to develop the ID format has been moved from the Contractor to the Systems Integrator with Contractor oversight.

(6) Task G: The base fee includes $110,719.00 that reflects options that will only be invoiced if a third proposal is received that requires detailed evaluation as delineated in G2.108 or competitive negotiations as delineated in G2.109. Removing the need for evaluation and negotiation of a third proposal will result in a decrease in the total contract amount by $110,719.00.

The Contractor will produce an integrated specification package that will be functional in nature, allowing different system technologies to compete and will form part of the procurement document as it is now the intent of the Commonwealth to procure the entire system from a single source, termed herein the Systems Integrator.

(a) G1.07 – The requirement to assist in frequency acquisition has been added. This includes research of LMR frequencies from the FCC database and to assist in licensing VHF, UHF and 800 MHZ frequencies for the MCT and Transportable cells.
(b) G1.101 – The requirement for Microwave field surveys has been deleted and will be accomplished by the SI.
(c) G2.104 - The requirement is reduced since facilities contract negotiation is now being done with a single SI and not multiple facilities vendors.
(d) G2.106 – New sub-task, which consolidates the LMR, Microwave, Intranet, MCT, Facilities, Buildings and Public/Private partnership requirements into one functional specification (Microwave procurement is now integrated into the SI upgrade contained in G2.105).
(e) G2.107 – New sub-task that includes review of draft specifications with potential SI Offerors in the CTA Communications office.
(f) G2.108 – New sub-task that includes the evaluation of additional proposals beyond the two contained in G2.105. For each additional proposal, there will be an increase of $63,582.00. Note: The cost of one of these additional evaluations is included in the Task G2 price.
(g) G2.109 – New sub-task that includes competitive negotiation with additional Offerors beyond the two contained in G2.105. For each additional negotiation, there will be an increase of $47,137.00. Note: The cost of one of these additional negotiations is included in the Task G2 price.

(7) Task H: Increase in task of $7,334.00.

(a) H.01 includes the deletion of the final design of the network interface and includes adding COGMARS, CAPWIN, both from the specification standpoint and evaluation and negotiation with System Integrator Offerors.

(8) Task I: Decrease in task of $(1,291,127). The cost of tower structural analysis is now the responsibility of the Systems Integrator as well as much of the detail design work for the radio sites.

(a) I.04 – The requirement is reduced as the Systems Integrator will be responsible for preparation of FAA documentation, notification and filing.
(b) I.05 – The requirement is reduced with the deletion of site-specific design, and adds requirement for review and oversight of Systems Integrator site-specific designs, preparation of generic drawings and specifications, resolution of comments, evaluation/negotiation of facilities part of proposals, and additional meetings in Richmond.
(c) I.102 – The requirement is reduced by the deletion for coordination of utilities and payment recommendations. Site visits to each LMR and Microwave site has been reduced from 4 to 3.
(d) I.103 – The requirement is reduced by deleting the requirement for ID of potential offerors, but is increased by preparation of guideline document for third party use of the sites.
(e) I-105 – The requirement is reduced as the Systems Integrator will now have responsibility for construction monitoring of the tower upgrades and installation.

(9) Task J: Decrease in task of $(123,546.00).

(a) J1.05 – The requirement is reduced as the Commonwealth will now be responsible for receipt testing of the MCT units.
(b) J1.06 – The requirement is reduced as the Commonwealth will now have the responsibility of testing the MCT subscriber units.
(c) J1.07 – The requirement for the Contractor to update the VSP procurement document for the existing 431 mobile data terminals has been eliminated.
(d) J1.09 – The requirement is reduced to reflect the Systems Integrator will accomplish the actual inventory under Contractor oversight.
(e) J1.11 – The requirement is reduced as the Commonwealth will now have the responsibility to verify test the MCT units.
(f) J2.01 – The requirement is increased to include solicitation of fixed network access requirements from all 19 participating agencies and a solicitation of paper survey of the access sites. One meeting in Richmond has been deleted.

(g) J2.102 – The requirement is reduced as the Systems Integrator will be responsible for the Intranet. This also reduces the test equipment requirements. The Contractor will provide oversight and testing.

(10) Task K: Decrease in task of $(640,871.00).
- (a) K1.01 - The requirement is reduced as the Commonwealth will now have the responsibility of testing the subscriber units. This also reduces test equipment requirements.
- (b) K1.02 – The requirement is reduced as the Commonwealth will now be responsible for testing the fixed infrastructure equipment.
- (c) K1.06 – The requirement is reduced as the Commonwealth will now provide the direction to the Systems Integrator in the programming of subscriber units.
- (d) K1-107 – The requirement is revised to include the cutover of eight (8) non-VSP communication centers.
- (e) K2.01 – The requirement is reduced as the Systems Integrator will be required to develop training plans under the Contractor's oversight.

(11) Task L: Increase in task of $656,236.00
- (a) L.01 – This requirement is increased to reflect a major revision of the schedule to indicate a turnkey Systems Integrator approach. In addition, a second revision will be made to the schedule after an award to the Systems Integrator to reflect the negotiated schedule.
- (b) L.03 – This requirement is increased to reflect a major revision to the budget after negotiations with the Systems Integrator.
- (c) L.04 – This requirement is increased to reflect up to four additional meeting per year with the Commonwealth budget personnel and preparation for the Virginia annual budget process.
- (d) L.06 – This requirement is increased to indicate an additional 18 User Agency Review Committee (UARC) meetings each year.
- (e) L.101 – This requirement is revised to increase the number of management presentation to four (4).

B. Reference Attachment B, entitled "Basis of Schedule of HSMM Fees": Revised Attachment B (5 pages) is provided as Attachment B to this Modification # 3.

C. Reference Attachment C, entitled "Schedule of Fees/Additional Services": Revised Attachment C (4 pages) is provided as Attachment C to this Modification # 3 that reflects the addition and deletion of fees delineated below:

Task C	$ 3,743.00
Task D	$ (81,511.00)
Task E	$ 636,739.00
Task F	$ 46,017.00
Task G	$ 296,255.00

Task H	$ 7,334.00
Task I	$(1,291,127.00)
Task J	$ (123,546.00)
Task K	$ (640,871.00)
Task L	$ 656,236.00
Net change of Modification # 3	$ (490,731.00)
Revised Contract Total:	**$20,039,388.00**

D. Reference Attachment D, entitled "Equipment List": Revised Attachment D (2 pages) is provided as Attachment D to this Modification # 3.

The foregoing is the complete and final expression of the parties' agreement to modify Contract VA-000100-HSMM and cannot be modified, except by a writing signed by duly authorized representatives of both parties.

ALL OTHER TERMS AND CONDITIONS REMAIN UNCHANGED.

PERSONS SIGNING THIS CONTRACT ARE AUTHORIZED REPRESENTATIVES OF EACH PARTY TO THIS CONTRACT AND ACKNOWLEDGE THAT EACH PARTY AGREES TO BE BOUND BY THE TERMS AND CONDITIONS OF THE CONTRACT.

CONTRACTOR
Hayes, Seay, Mattern and Mattern

BY: Signature on File
Cheryl S. Giggetts
Vice President
CTA Communications, Inc.

DATE: September 28th, 2001

PURCHASING AGENCY
Department of State Police

BY: Signature on File
Colonel W. Gerald Massengill
Superintendent

DATE: September 28th, 2001

ISSUING AGENCY
Department of Information Technology

BY: Signature on File
Teresa M. Hudgins
Procurement and Contract Officer

DATE: September 28th, 2001

Task A

A. *The contractor shall inventory the assets (both equipment and transmitter sites) and provide a radio needs assessment for the following state organizations. This shall include growth that is expected within the next ten years. The Federal organizations currently registered on the system shall have a needs assessment performed. A list of these Federal organizations will be provided at the pre-proposal conference. The needs assessment shall include present and future data requirements, both mobile and fixed. A list of Commonwealth counties and cities that may be participating in this network will be provided to the contractor. The contractor shall visit each of the following organizations and submit a report that documents the present asset inventory and the expected growth in ten years. A needs assessment, inventory, or travel to the participating localities or Federal organizations is not anticipated.*

- *Virginia Department of State Police*
- *Virginia Department of Alcoholic Beverage Control*
- *Virginia Department of Aviation*
- *Virginia Department of Conservation and Recreation*
- *Virginia Department of Corrections*
- *Virginia Department of Emergency Services*
- *Virginia Department of Environmental Quality*
- *Virginia Department of Fire Programs*
- *Virginia Department of Forestry (Charlottesville)*
- *Virginia Department of Information Technology*
- *Virginia Department of Game and Inland Fisheries*
- *Virginia Department of Health*
- *Virginia Department of Juvenile Justice*
- *Virginia Department of Military Affairs (Fort Pickett, Blackstone))*
- *Virginia Department of Mines, Minerals, and Energy (Wise County)*
- *Virginia Department of Motor Vehicles*
- *Virginia Department of Transportation*
- *Capitol Police*
- *Marine Resources Commission (Newport News)*

The following items were agreed upon during negotiations:

The contractor shall consider aircraft communications in the needs assessment and in the design. As a Division is migrated onto the system, aircraft communications shall be available to the extent that the design permits. Each agency shall have the capability to monitor site operations and system statuses. All facilities, towers, and radios shall have remote alarms to notify VSP dispatchers of intrusion alarms and VSP network operators of malfunctions. All dispatching consoles shall be capable of intercommunicating, including those from different agencies. In-building coverage is required in all state buildings in the capital area to the extent described herein.

The following tunnels will require LMR coverage.
1. Big Walker Mountain Tunnel (I- 77)
2. Hampton Roads Tunnel (I-64)
3. Elizabeth River Downtown Tunnel (I- 264)
4. Monitor-Merrimac Memorial Bridge-Tunnel (I- 664)

5. & 6. Chesapeake Bay Bridge Tunnels (2 tunnels, US-Rt.-13)
7. Elizabeth River Midtown Tunnel (US-Rt.-58/337)
8. East River Mountain Tunnel (I- 77)

This scope of work is based on the attached table listing subscriber units. Any change in quantities by more than 10% may result in a change order. Any changes in quantities must be agreed to prior to beginning Task G.

The following sub-tasks address the work requirements for the above RFP Task.

A. User Agency Assessment

For the purposes of this task, our efforts will be directed to and limited to the 19 Commonwealth of Virginia primary LMR system users and the Federal Government users identified in the RFP and other official correspondence provided by the Commonwealth regarding this project. The Federal Government agencies will be represented by a single contact, who will be empowered to obtain information from the agencies and to discuss their needs and current situation with HSMM. Information provided with respect to the Federal Government agencies will be consolidated, in tabular or text form, and where available will be provided in digital format.

The purpose of this assessment is to develop information necessary for the upgrade of the existing VSP system to accommodate the listed State agencies, and to provide functionality and coverage as required by the Commonwealth.

A.01 Inventory Subscriber Equipment

HSMM will meet in Richmond with representatives of 15 state agencies located there, and in the headquarters location of the remaining four agencies to determine existing subscriber unit documentation and establish inventory requirements. We will review the inventory documentation provided by the 19 state agencies. We will also develop a database that documents subscriber units for all agencies. We will then provide the inventory to state officials for review. All suggested changes will be incorporated and the subscriber unit database and supporting documentation will be finalized. The Commonwealth will be responsible for surveying any participating or potentially participating localities (cities or counties). In the event that a locality elects to participate in the system, and the Commonwealth determines that such locality is indeed a candidate for participation, HSMM will, upon direction of the Commonwealth, perform a needs assessment survey for that locality at a unit price as established in the schedule of fees under “added services”.

We note that there are two additional agencies (The Office of the Governor and Consolidated Laboratories) that will be included as part of the other 19 agencies. The needs assessments for the Office of the Governor and Consolidated Laboratories will be addressed as part of the needs assessments of the agencies that are responsible for providing radios to them.

A.02 Inventory Fixed Infrastructure

HSMM will physically inventory all fixed end infrastructure equipment for the Virginia State Police (VSP) as part of Task C. We will rely on documentation provided for the inventory of the remaining 18 state agencies. Our engineers will visit existing radio sites of non-VSP agencies only to the extent that use of these sites are contemplated as part of the overall LMR network design. At those sites we will review and spot-check drawings and data provided to confirm completeness and accuracy. We will review the inventory documentation provided by the 19 state agencies. Since none of the non-VSP agency equipment is to be re-used in the ultimate VA PS LMRN, HSMM will not log, track, or evaluate current assets. Finalized system documentation will include system capacity, routing, coverage areas, radio user operating parameters, site, tower, and building conditions, and frequencies in use to the extent provided by the agencies and our physical inventory of VSP.

We assume that the documentation provided by the agencies will be adequate and complete. Should we discover that this is not the case, we will advise the Commonwealth, and together determine a course of action.

A.03 Review of Federal Organization Needs

There will be a single point of contact for all Federal organizations, who will be empowered to act on behalf of those organizations with respect to the needs assessment. HSMM will review all responses from the point of contact for the federal agencies. This information will be included in the overall report.

A.04 Develop a 10-Year Growth Plan

HSMM will develop a 10-year growth plan addressing requirements and projections for each of the 19 State agencies identified in the RFP, and all federal agencies listed, to the extent that the information is provided to HSMM by the federal agency point of contact. Resulting information will be published by HSMM. We will depend heavily on future projections provided by the Commonwealth and the participating agencies to determine future radio growth requirements. Future radio growth will be based on projected population growth. We will review and analyze historical statistics provided by the Commonwealth.

A.05 Assess Data Requirements

As part of our review of mobile data requirements HSMM will address and review both current mobile data requirements, Intranet requirements and the future requirements as provided to us by the participating agencies.

HSMM will review mobile data requirements for each state and the federal agencies, as provided by the single point of contact. We will review all existing hardware and software as part of the interview process. We will then review the data management plan for state and department implementation.

A.06 Visit and Interview Each Agency

HSMM will visit and interview the 19 State agencies. We recognize that four of these agencies are located outside the Richmond area. We intend to visit their headquarters locations as we describe in this section. With respect to visiting the radio sites currently in use for each agency, we intend to visit each VSP radio site as described in Section C.01. We will visit other agency's sites to the extent they are included in the ultimate VPSLMRN.

We expect that each Commonwealth of Virginia agency involved in the project will appoint a representative who will act as the point of contact for that agency during the project. The Commonwealth will identify these representatives and provide a list including telephone, FAX, address, and e-mail address. This representative should be familiar with the two-way radio environment of the agency and be able to effectively coordinate between the agency and HSMM. We assume that this representative will be available upon reasonable advance notice for interviews, teleconferences, and to review documents and respond to information requests. Should this not prove to be the case, the Commonwealth will identify an alternate and provide the information to us.

Our engineers will review and augment existing system data in the records of the participating agencies. We will review existing system and operational data from the users and maintenance personnel. We will request from the Agency Representative the latest information on the present systems and operations. This will comprise details such as: lists of equipment; existing site and facility drawings; operational procedures; traffic loading; future requirements; and growth projections. The Commonwealth will ensure that this information is provided to the extent that it is available.

In advance of the first visit and interview, we will conduct an Initialization Meeting in Richmond involving the representatives of all-participating agencies and users. This meeting will outline the project objectives and methodology and solicit advice and assistance of all attendees. This meeting will introduce key Commonwealth representatives, as well as the HSMM personnel assigned. The Commonwealth will introduce the assigned Project Manager and identify the responsible Agency Representatives individuals from each department.

The Agency Representatives will schedule interviews with the users of participating agencies. It is envisioned that each agency's interviews will be scheduled as a block. With the larger agencies, the interviews should be scheduled in geographic or operational divisions with the advice of the Agency Representative. We will conduct on-site facility and operational surveys in Richmond, except for the four agencies located outside Richmond, in which case we will travel to their headquarters location.

The survey team will conduct three weeks of interviews in Richmond. We will conduct a number of personal interviews, some with individuals and some with groups. We will directly observe the Richmond area dispatch centers operations, taking notes, asking questions, and analyzing procedures. We will review the latest statistical data on calls for service and responses. We will also study applicable staffing levels, special operational requirements, fixed and rotary-wing aircraft (including military) communications, unique dispatch procedures, data, documentation and system status requirements via an Intranet and interoperability needs. The engineers require enough operational and system requirement information to develop parameters such as:

- Channel and loading requirements
- Types and capabilities of radio units needed
- Quantities of present and future radios
- Quantities and functions of consoles
- CAD and Console capabilities and requirements
- and other system design elements

A.07 Submit Agency Reports

Upon completion of the above tasks HSMM will prepare and submit two bound copies of a draft report describing our assessment of the two-way radio communications needs of each agency. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part. Our report will contain the baseline of each agency's current communications environment. Budget and cost estimate information will be developed in the Master Budget as part of Task L.

Commonwealth officials will review the draft report document, and provide consolidated comments to HSMM. We envision the comments will be provided to HSMM within ten working days after receipt of the report document. Upon completion of the draft review and approval of the contents, we will publish a Final Report, including a focused executive summary directed to that agency's officials. We will provide twenty bound copies, one for each agency, plus one unbound copy. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

Task B

B. *The contractor shall research and document the radio frequency authorizations for the agencies in the above paragraph and selected localities. The Commonwealth has licensed 40 VHF high-band channels that are planned to be the basis for this upgrade project to a trunked architecture. The four present State Police dispatch channels are planned to be the control channels. The contractor shall develop a channel plan that maximizes the resources available, devise a frequency reuse strategy based on the existing State Police Division boundaries, determine the capacity of the channels (considering both voice and mobile data), and if required, obtain additional channels of sufficient quantity to meet the present and anticipated requirements not met by the existing channels. The channel plan shall include all of the operational talk groups. The contractor shall design and include contingency programming for all of the subscriber equipment that will be loaded into the units for potential public safety emergencies. Users shall be able to travel throughout the Commonwealth (across Division boundaries) and be able to communicate in that Division and back to their home Division. The contractor shall consider any potential interference (both co-channel and adjacent channel) to or from existing users when developing the channel plan. The channel plan shall ensure that there is no interference to a radio whose licensee has granted concurrence to the LMR upgrade project on a non-interference basis. The contractor may consider, if required, additional radio frequency bands that are not presently in use. The contractor shall consider including localities, not previously identified, that can contribute usable radio frequencies or clear up interference. In determining a usable frequency, the contractor shall consider one that may be used in: the same radio, a mobile antenna with 3 dB of gain, and the same duplexer or transmitter combiner network. The channel plan shall at least consider the implementation of FDMA, TDMA, and Linear Modulation. The channel plan shall consider loading issues for both voice and data. (No travel requirements are expected for this task.)*

The following items were agreed upon during negotiations:

All Talk Groups identified for use on the system shall be developed by the contractor including each subscriber ID, not just templates

The channel plan shall consider loading issues for both voice and data. The channel plan shall consider both private individual agency communications and joint interagency communications. The channel plan's contingency programming shall consider reassigning the appropriate priorities to specific agencies or talk groups based upon the communications scenario it was designed to facilitate, as that scenario is identified by the agencies in the "needs assessment" task. (No travel requirements are expected for this task.)

The contractor shall attempt to obtain frequencies if more are needed. This includes identification, engineering, application preparation, and follow-up resulting in licensed usable frequencies to the extent described herein.

The following sub-tasks address the work requirements for the above RFP Task.

B. Channel and Talk Group Planning

The tasks in this section cover the aspects of radio frequency channel planning and radio user talk group planning.

Radio channel planning is covered in Task B-1 and deals with the technical aspects of radio frequency allocation, spectrum analysis and interference. Development of a VHF radio channel plan is a highly technical and complex process, given the propagation and interference characteristics of the frequency band, and the band configuration as set up by the FCC. For this reason, we will utilize an advanced computer model (VFAM) to establish and update the frequency plan. This is described in Task B-1.

Talk group planning is covered in Task B-2 and deals with the operational aspects of user talk groups, ID assignment and fleet mapping. Talk group identification and fleet mapping are dependent on the operational use to which the radio system is to be put. The design aspect is not particularly complex, however it does require careful record keeping and tracking. What is important, however, is the process of establishing talk groups such that the fleet map is effective, easily used by field personnel, and does not encourage frivolous use of the system. This process is one of education and guidance. We have described in B-2 both of these concerns.

B1. Spectrum Analysis – Channel Plan (Proprietary)

B1.01 Channel Plan Development (Proprietary)

B1.02 Channel Plan Submittal (Proprietary)

B2. Talk-Group Plan

Through the use of VFAM, HSMM will determine the capacity of the channels with each pass. Part of the process of establishing the capacity of the system is to take into consideration the operational characteristics of each of the agencies. This includes consideration of the loading characteristics for each of the agencies, the way they use their radios, the way that they travel throughout their own operational area as well as how they roam from one operational area to another. These factors are inputs to the Capacity Analysis Module of VFAM, and were described in Task B1 of this scope of work.

Talk group designation or fleet-mapping is a second aspect of the channel plan. This is separate from the VFAM analysis. The number and makeup of talk-groups also takes into consideration such factors as interoperability, contingency planning, and ease and straightforwardness of operation for the users.

The result of the frequency selection process, therefore, will be a frequency plan that provides the capacity to support all users at the operational loads to which they are accustomed (or projected), provides coverage and eliminates interference from that system, and reuses frequencies and equipment to the greatest extent practical. The end result of the fleet-mapping process is to provide an operational environment that is straightforward, easily understood by the users, addresses the routine and the emergency needs of the agencies, from the perspective of the agency operating alone and also from the perspective of the agency operating along with other agencies in a multi-agency activity. This will require substantial interface with the user agencies, involving education, guidance, and review of the plan on a regular basis.

HSMM will provide spectrum services to document and develop a Talk-group and ID plan that will define the communications requirements for all agencies participating on the VPSLMRN. These services include the documentation of the existing talk-group-structure. An analysis of the current operating requirements for each agency will be recorded. New voice and data requirements and radio user ID requirements of the existing Commonwealth agencies will be merged with the communications requirements of new participating agencies.

These tasks include the development and delivery of the Talk-group Plan (down to the radio user ID level), to support the voice and data communications needs of the VPSLMRN radio-user community.

B2.01 Talk-Group Plan Development

As a result of the VFAM findings, the channel plan report, and the results from needs assessment interviews with Commonwealth participants (refer to Task A.06), talk-group and radio user ID requirements will be obtained, documented, analyzed and refined by HSMM. A preliminary Talk-group Plan down to the radio user ID level will be defined based on the present and future

As a result of the VFAM findings, the channel plan report, and the results from needs assessment interviews with Commonwealth participants (refer to Task A.06), talk-group and radio user ID requirements will be obtained, documented, analyzed and refined by HSMM. A preliminary Talk-group Plan down to the radio user ID level will be defined based on the present and future voice and data operational parameters of the radio user community participating on the Commonwealth system.

The Talk group plan will be flexible and be designed to accept expansion, additions and updates. The Talk-group Plan will take into account special emergency response scenarios and contingency programming (dynamic regrouping). The Talk-group Plan will include identified participants who have been interviewed for this purpose. The Talk group Plan will also document and assign appropriate priorities levels for voice and data groups. Data groups will always be delayed when in contention with voice groups.

HSMM will provide two copies of the preliminary Talk-group Plan developed under active user participation, in draft format to the Virginia Project Manager for review. We will hold a meeting with the Virginia Project Manager to explain the Talk-group structure and its ability to support the radio users participating on the Commonwealth radio system. After this meeting, copies of the preliminary Talk-group Plan will be send to key representatives for their review and comment. We will provide 20 bound copies of this plan, plus one unbound copy, one for each state agency identified in the RFP and one copy for FLEWUG. We will post the document on the Intranet.

Responses to the preliminary Talk-group Plan will be collected and analyzed by HSMM. Pertinent revisions shall be incorporated into the Talk-group Plan.

B2.02 Talk-Group Plan Submittal

The Virginia Project Manager will collect all feedback of the preliminary Talk-group Plan from the designated agency representatives. This information will be assimilated and forwarded by the Project Manager to HSMM.

As a result of the review cycle of the draft preliminary Talk-Group Plan, HSMM will incorporate pertinent revisions in order to finalize the Talk-group Plan. The report will be assembled and organized to display the communications parameters for all agencies participating on the Commonwealth system. The final Talk-group Plan will be published by HSMM and 20 bound copies plus one unbound copy of the report will be sent to the Virginia Project Manager for distribution to the designated agency representatives. We will post the document on the Intranet.

HSMM recognizes that talk group requirements will change during the course of the project. HSMM will work with the Commonwealth and update Talk Group and ID assignments as required as conditions change during project implementation. This is further addressed in more detail in Task K1.06.

Task C

C. The contractor shall evaluate and document the Virginia State Police's current radio infrastructure resources. The contractor shall visit each of the State Police transmitter sites (both LMR and microwave). This analysis shall include at a minimum the transmitter sites, towers and transmitter buildings. Structural information shall be provided for each resource to include condition, dimensions, power sources, HVAC capacity, fire protection, accessibility, site directions, and tower loading based on previous documentation. The contractor shall submit a report that documents the findings. The contractor shall take pictures to document each site with a digital camera and provide them to the State Police Communications Division in a digital format.

The following item is part of Modification #3:

The number of current VSP microwave sites is 87, 47 of which are also LMR sites.

The following sub-tasks address the work requirements for the above RFP Task.

C. Virginia State Police Infrastructure Evaluation

HSMM will investigate the VSP infrastructure in depth, generally documenting the radio sites, the radio equipment, and the condition of each. Documentation will be sufficient to identify facilities capacity (space, HVAC, main and backup power, etc.) and to estimate the condition of the facilities and equipment. This will include certain sketches, dimensions critical to the installation of specific equipments, non-dimensioned floor plans, antenna location diagrams, and other information as deemed necessary by HSMM to adequately describe site conditions for purposes of developing solicitations. Provision of dimensioned drawings, complete as-built documentation, and equipment interconnect drawings may be provided at the option of the Commonwealth and as additional scope.

The information from Task C will be used to determine what equipment and facilities are capable of being re-used in Task G, design. The tower evaluation that is part of this task is intended to provide a general order-of-magnitude estimate of tower capabilities. Task I includes actual tower structural analysis, which may or may not be done concurrently with this task.

We base our scope on the current count of 87 microwave sites, 47 of which are LMR sites. We have provided for revisits to a maximum of 20% of these sites to account for access problems or obtaining additional information that might have been unavailable at the time of the first visit. Additional sites may be identified during the course of the investigation.
These additional sites are not contained in this scope of work. Such additional sites will be subject to appropriate renegotiation of fee and possible schedule modifications.

Nevertheless, we expect, as part of this task, VSP will endeavor to provide the right people, and to establish permission from the right agencies, and to carry with them keys or other access tools necessary to inspect the sites so that the information may be gathered on the first visit.

We also expect, as part of this task, VSP will schedule this assistance in coordination with the overall site visit schedule, which will be set up to provide reasonable and efficient logistics.

To obtain information for Console and Computer Aided Dispatch requirements of Task D, we will be investigating these items as part of this initial survey. We will expect that the VSP will make their dispatch centers available as part of this schedule, with the necessary personnel available for interview and to demonstrate the equipment. For the purpose of this project these dispatch centers are located at divisional headquarters. Travel to Area Offices not part of the microwave network is not part of this scope of work.

C.01 Visit Each Virginia State Police LMR Site

HSMM will finalize a work-plan and schedule for surveying the VSP's 47 land mobile radio sites. We note that according to the information provided at the pre-proposal conference, all of the LMR sites are co-located with microwave sites. The work-plan will involve developing a list of and acquiring the materials and equipment needed to conduct the site surveys, developing a template that lists the categories of information the survey teams are to gather at the sites and allocating the resources needed to conduct the surveys.

HSMM will coordinate with the VSP to plan the surveys of the 47 land mobile radio sites. VSP technical or maintenance personnel are expected to be available during the surveys to answer technical questions about the site.

During the site surveys, HSMM will visit each site to determine if the following information is generally in conformance with previous documentation provided by the VSP. The VSP provided information will be developed into a database including notes indicating general conformance or non-conformance on a site-by-site basis. HSMM expects that VSP will provide available information in the following areas. HSMM will investigate the accuracy of that information and assess the condition of the following equipment and physical facilities:

- The existing communications and site equipment.
- The condition of the communications equipment and antenna systems and their installation.
- The tower and antenna installations on the tower to see if they match the current FAA and FCC licenses held by VSP.
- The tower latitude and longitude coordinates as identified by a GPS receiver.
- The building floor plan.
- How the equipment at the site interconnects with the VSP communications network.
- The site power and backup power systems.
- The condition of the building and site facilities (HVAC, fire suppression systems, access road, etc.) and develop or update a site sketch showing general locations of major items, and opportunities for location of additional equipment.

- The existing condition of the tower. (We note that the tower condition will be analyzed in detail as part of Task I. Assessment of the tower as part of Task C is of a general nature only.)

We will also make a reasonable effort to identify the characteristics of other radio tenants either on site or nearby. This information is needed to establish interference characteristics of the site. We note that some of the sites on the VSP network have a large number of tenants, or are part of tower complexes where multiple towers are located on the same mountaintop. If we identify situations where either tenant information is not forthcoming, or tenant identification is not reasonably evident, we will alert the Commonwealth project manager of that fact, and will mutually develop a course of action to obtain the needed information. We will not make any RF measurements during this investigation.

C.02 Visit Each Virginia State Police Microwave Site

HSMM will review the FCC, FAA, and site documentation currently available from the VSP.

HSMM will finalize a work-plan and schedule for surveying the VSP's 87 microwave sites. The work-plan will involve developing a list of and acquiring the materials and equipment needed to conduct the site surveys, developing a template that lists the categories of information the survey teams are to gather at the sites and allocating the resources needed to conduct the surveys.

HSMM will coordinate with the VSP to plan the surveys of the 87 microwave sites. VSP technical or maintenance personnel are required to be available during the surveys to answer technical questions about the site.

During the site surveys, HSMM will visit each site to determine if the following information is generally in conformance with previous documentation provided by the VSP. This information will be developed into a database including notes indicating general conformance or non-conformance on a site-by-site basis. HSMM expects that VSP will provide available information in the following areas.

HSMM will investigate the accuracy of that information and assess the condition of the following equipment and physical facilities:

- The existing microwave and site equipment.
- The condition of microwave radio equipment and antenna systems and their installation.
- The tower and antenna installations on the tower to see if they match the current FAA and FCC licenses held by VSP.
- The building floor plan.
- The microwave equipment at the site interconnects with the VSP communications network.
- The site power and backup power systems.
- The site grounding and surge protection systems.

- The condition of the building and site facilities (HVAC, fire suppression systems, access road, etc.) and develop or update a site sketch showing general locations of major items, and opportunities for location of additional equipment.
- The existing condition of the tower. (We note that the tower condition will be analyzed in detail as part of Task I. Assessment of the tower as part of Task C is of a general nature only.)

C.03 Document Each Site

HSMM will develop and manage a database for the site information and pictures gathered at the land mobile radio and microwave sites. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

C.04 Evaluate Virginia State Police Infrastructure Resources

HSMM will review the existing microwave path analysis to research design options. HSMM will also evaluate the microwave and LMR station equipment.

HSMM will make a pre-structural review for existing towers and evaluate existing site facilities. The structural analysis will be part of Task I.

C.05 Submit Infrastructure Evaluation Report

HSMM will distribute two copies of a draft report that documents the condition of the land mobile radio sites and microwave radio sites. We will meet with the VSP to review the draft report. We will include the modifications requested by the VSP and issue 8 bound copies plus one unbound copy of the final report. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

C.06 Photograph Each Site

HSMM will take digital photographs of the sites. We will create an image management database to keep track of the site pictures. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part. No hard copies are required by the Commonwealth.

C.101 Dispatch Center Surveys

Concurrent with the survey effort, HSMM will conduct site surveys of each of the 7 Division Headquarters and the Training Academy dispatch facilities. HSMM will coordinate with VSP to plan the surveys of the dispatch centers.
VSP technical and operational (dispatch and management) personnel are required to be available during the surveys to answer questions about the dispatch centers and to demonstrate operations of the consoles and the CAD.

HSMM will schedule and assign personnel to perform the surveys of the dispatch centers. The engineering data will be assembled into a database that will be created and managed by HSMM. HSMM will incorporate the survey data into an engineering inventory report, and use the information to establish the impact of the various technologies studied in Task D on the consoles and CAD.

Task D

D. The contractor shall provide a report that documents an assessment of the available microwave and LMR technologies that are suitable for the Commonwealth to upgrade as a state wide shared public safety wireless network. The assessment shall include Trans-European Trunked Radio (TETRA), Project 25, TDMA (Ericsson), OpenSky (Amp Wireless), and Linear Modulation (Intek). Conventional, trunked network, and simulcast architectures shall also be assessed. The contractor's study shall be independent of manufacturer and technology. The contractor shall also evaluate the impact on the VSP Computer Aided Dispatch system and VSP radio consoles. The Commonwealth will review the assessment to determine minimum features and requirements for the LMR upgrade design. The contractor shall conduct a performance test of the leading mobile radio technologies to verify the manufacturers' claims

The following items were agreed upon during negotiations:

The contractor shall conduct a performance test of the leading mobile radio technologies to verify the manufacturers' claims as described herein.

Modification # 2 changed the scope of specification preparation to a single systems integrator concept rather than five separate procurements with up to eight separate offerors as described in the Scope of Services, Section G2. For further clarification, the following definitions are provided:

Systems Integrator Offeror – A firm that submits a proposal in response to the Systems Integrator Request for Proposal.

Systems Integrator – The firm that as a result of the Systems Integrator Request for Proposal is awarded such contract.

The following items are part of Modification # 3:

The performance test of the mobile radio system technologies shall take place as part of the evaluation of the Systems Integrator Offeror proposals. Offerors will be required to provide a working prototype of the LMR site module and subscriber equipment that is representative of the system they propose. The contractor shall perform a technical evaluation of these systems and issue a system technology testing report to include the results of these tests, an analysis of the data, and recommendations.

The tests will include coverage, interference, functionality, and feature related performance tests. The contractor shall perform these tests on up to two System Integrator Offerors' system technologies, with an option to test additional system technologies as an additional service.

The Contractor shall investigate financing options with offerors or potential Systems Integrators, options to include revenue for the Commonwealth, delayed payment terms, and payments based on availability of the system for access by other users.

The requirement to visit an operational VHF system is deleted.

The requirement for a formal Technology Assessment Report is deleted. The contractor shall provide the COV, with minimal additional work, the research and other information that is on hand.

The following sub-tasks address the work requirements for the above RFP Task:

D.01 System Technologies Assessment Initialization

HSMM will initiate the required LMR system technologies investigations by completing a comprehensive investigation work plan for each LMR system technology. We will review the system technology investigation plans with the Commonwealth and conduct an initialization/kickoff meeting with appropriate Commonwealth personnel to start the investigation process.

D.02-D.04 Research LMR System Technologies

HSMM engineers will research the Trans-European Trunked Radio (TETRA), APCO Project 25, TDMA (or F-TDMA), Linear Modulation, and OpenSky technologies. HSMM will perform a background search for each system technology (via the Internet, technical libraries, subject matter white papers, etc.) and initiate dialog and meetings with each of the various system technology vendors. Performance test plans will be developed, and the appropriate test equipment suitable for each system technology will be obtained. We are only aware of Motorola as the sole supplier of APCO Project 25, Intek as the sole supplier of Linear Modulation, Ericsson as the sole proponent of TDMA (and their F-TDMA technology), and Amp Wireless as the sole supplier of OpenSky. To our knowledge, Motorola is the only US company that is actively involved in supplying TETRA equipment. System performance data and research results will be reviewed, analyzed and recorded.

We intend to perform propagation and limited functional testing at the SPHQ tower in Richmond (The "Test Bed Site"), for the purpose of comparison testing of the system technologies to establish their potential suitability of the system technology for use in this system. This will be done as part of the evaluation of Systems Integrator Offeror proposals, using Systems Integrator Offeror supplied equipment described under Task G. The system technology functional testing will be part of the overall evaluation of each SI candidate. The results of the testing will be incorporated into a system technology testing report.

Testing will be done for up to two Systems Integrator Offerors' system technologies (one per Offeror), with the Commonwealth having the option of testing additional system technologies as an additional service (described in D.06).

General Process Description: Comparison testing of the system technologies

We will measure both the signal level and understandability (DAQ) for each system technology, and will compare these with the Baseline Test System. This will entail installation of equipment for each of the system technologies at the Test Bed Site in turn, and making both absolute and comparative measurements against the Baseline Test System. Equipment for each of the system technologies will be obtained by the Commonwealth as a requirement placed on the Systems Integrator Offerors by the Systems Integrator specifications, and installed by the Systems Integrator Offeror at the SPHQ tower in Richmond as the Test Bed Site. The system technologies

will be tested by HSMM in turn, while the Baseline Test System (described under Task G) will be operational throughout the process. Since these measurements are necessarily done sequentially, we expect significant variations in signal over time due to differing weather, seasonal, and atmospheric conditions. Therefore the comparison test between each system technology and the Baseline Test System must be done in real time, and we provide for that in our schedule and our process.

The specific process we intend to use in the comparison testing effort will include the following:

- As part of the evaluation process for a Systems Integrator, described as part of Task G, the Systems Integrator Offeror will install a test system at the test bed site.

- The Commonwealth will have installed the "Baseline System".

- For each of the system technologies, HSMM will make both absolute and comparison tests on both the Baseline System and the technology specific system (including both signal level and DAQ), and then provide a comparison analysis to the Baseline system. In addition, HSMM will make functional tests deemed appropriate by HSMM and the Commonwealth.

- The Systems Integrator Offeror will be tasked to provide all radio equipment including vehicular repeaters and vehicles to be used in the test. The Commonwealth will supply antenna systems, power, and appropriate microwave circuits, if necessary and available. HSMM will supply the signal level test equipment.

Because these tests utilize a common test site and antenna system they must be performed in series. This may cause the Systems Integrator Offeror evaluation schedule to increase accordingly. These tests will encompass the extent of the testing of each system technology. We will document features and functionality differences to the extent that they are apparent in the technology specific system.

This program will provide valuable insight into the necessary signal levels for system design for each technology. We note that because this is essentially a functional test including a propagation test, some of the design considerations necessary for the specific system technology may not be apparent in a test of this nature, and only a truly operational wide-area test may provide the engineering data necessary for actual system design.

We believe that there will be some engineering design factors in this system that will become evident after a system is operational in a wide-area configuration, and using frequencies that are not all exclusively assigned to the State. We believe that at least some of these design factors will be due to sporatic interference from distant sources, and the effect may be to require increased signal levels or to modify digital handshake protocols. It is for this reason that we recommend the first system be carefully tested under operational conditions (Commonwealth System Review) while there is still time to modify later systems with information obtained from that test.

D.05 Research Financing Options

HSMM will, as part of the system technologies analysis and the Systems Integrator Offeror evaluation, review private financing options including leasing, private ownership, private

operation under COV oversight, and revenue production from third party use of infrastructure as those options are proposed by the Systems Integrator Offerors.

D.06 Research of Additional LMR System Technologies

HSMM will, at the Commonwealth's option test an additional system technology (beyond the two as described in section D.02-D.04). This will be done on an "as authorized" basis by the Commonwealth and the pricing of this task represents a per Offeror cost.

D.07 Research Microwave Technologies

HSMM engineers will research available microwave technologies, in conjunction with the microwave assessment data collected during the VSP microwave system survey (refer to Task-C). HSMM will investigate new technology options for the upgrade of the current VSP microwave system. HSMM engineers will also analyze the various options for compatibility with the various LMR system technologies under evaluation in Tasks D.02 through D.06 above.

D.08 Commonwealth Review

HSMM engineers will compile and assemble all research results and other pertinent information for Commonwealth review. Eight copies of the presentation material will be supplied by HSMM. This material will be kept confidential, and will not be disclosed to others, unless so directed by the Commonwealth. The procurement document will include language that safeguards the future confidentiality of this information. Commonwealth officials will review the data and research results, and provide consolidated comments to HSMM. We envision the comments will be provided to HSMM within five working days after the initial testing results are provided.

D.09 Evaluate System Technologies with respect to Architecture

After the LMR and microwave technologies investigations and the system technology testing report review by the Commonwealth are completed, and as part of the evaluation process in the selection of a Systems Integrator, HSMM engineers will perform an Impact Analysis of the LMR and microwave technology applications to a state-wide VHF trunked radio system serving a large number of public safety agencies and departments.

Our Impact Analysis recommendations are provided to the Commonwealth as a decision-making tool that takes into account the relative importance of a number of operational concerns, and integrates the operational assessment with the ability of particular system technologies to fulfill the operational criteria. The objective is for the results to be viewed by decision-makers as well founded and impartial. Performance trade-offs, technology viability, costs, availability, etc. will be addressed. HSMM will evaluate the system technologies and Systems Integrator Offeror proposals specified for evaluation in the project RFP with respect to the standard trunking and simulcast system technologies available today.

HSMM will, as part of the technologies analysis, review private financing options including leasing, as those options are reasonably identified.

D.10 Evaluate VSP Computer-Aided Dispatch (CAD) and Radio Consoles

During Task C, HSMM engineers will identify and review the VSP CAD and the radio consoles. As part of this task, we will identify the impact of the new LMR and microwave technologies on the VSP CAD and radio console systems, and will consider these dispatch facilities in our preliminary design. We will focus on re-use and integration of existing dispatch facilities with the upgraded VPSLMRN system.

D.11 Technology Report

The requirement for a formal Technology Assessment Report is deleted.

D.101 VHF Technology Assessment

HSMM will analyze the Virginia Tech Reports and review the current system technologies that are available. HSMM will initiate dialog with current LMR system vendors. Investigation results will be reviewed, analyzed and recorded by HSMM. A letter report summarizing the investigation will be submitted to the Commonwealth, followed up with a technical review meeting at which time the report findings can be discussed. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

Task E

E. The contractor shall design and generate the technical procurement documentation for the facility to house the common control and processing hardware and administrative support staff and to upgrade an existing facility as a separate/alternative site. The upgraded facility shall house the back-up subsystem and will be made operational first for the Division 1 implementation. When the new facility is completed, primary operation shall be transferred there. The Contractor shall be responsible for the successful transfer of network operation to the new facility.

The following items were agreed upon during negotiations:

The above paragraph is modified to reflect the following:

Complete architectural and engineering design services are not to be provided under this contract. The Commonwealth will determine the appropriate procedure for procuring the construction for the new building and the renovation of the existing (whether through capital outlay procedures, non-capital outlay procedures, or design-build) and will procure such services. The consultant shall provide design specifications for the communications aspects of the buildings to the Commonwealth for use in purchasing the construction services and shall discuss the specifications with the Commonwealth and possibly an architect-engineering firm that would be selected by a separate solicitation. The communications aspects of the building shall include all the requirements of the communications area of the building. This includes such functions as console operations, network computers, office space, emergency power, etc. This requirement includes both the primary and backup facilities.

The following items are part of Modification #3:

The contractor shall prepare functional design criteria for the upgraded facility, and pre-schematic design for the new facility, for inclusion in the systems integrator requirements.

The contractor shall provide functional design criteria for seven VSP communications centers located at the Divisional HQ to accommodate an increase to eight dispatch/call taker positions. The VSP Data Processing Division will be responsible for obtaining and installing additional CAD terminals for the new positions.

The contractor shall provide design and layout review.

If a Capital Outlay appropriation is to be used for the facility upgrade and new facility, a subsequent procurement may be required in accordance with the Commonwealth of Virginia Construction and Professional Services Manual.

The following sub-tasks address the work requirements for the above RFP Task.

Functional specifications and designs developed under this task will be assembled into the overall Systems Integrator specification developed under Task G.

If a Capital Outlay appropriation is to be used for the facility upgrade and new facility, a subsequent procurement may be required in accordance with the Commonwealth of Virginia Construction and Professional Services Manual. The Network Control Site effort described herein assumes that the Systems Integrator will do the construction work. Should the Commonwealth require the Capital Outlay process, an amendment to this task may be required to accommodate that process.

HSMM will provide the design effort described herein up to and including the review of the Systems Integrator design drawings, but does not include services beyond this including attendance of the pre-construction meetings, monthly telephone conferences, site reviews or construction observations

E. Network Control Site (Prime Site) Development

This entails design of a new facility and upgrade of an existing prime site facility. Our preliminary schedule for installation of prime site radio equipment is, according to the schedule contained herein. Our preliminary estimate for the size of the new building is approximately 10,000 square feet of which approximately 3,000 to 5,000 square feet would be dedicated to communications equipment. HSMM is responsible for preparing schematic specifications for the electronic equipment room. This includes determination of size of the equipment room, functional floor plan, definition of service clearances, heat loads, power loads, and functional description of emergency power, fire detection and prevention systems, security systems and general description of the space to include such items as overhead cable racks, raised floor, etc.

1. HSMM understands that the design and construction of prime site and upgrade (renovation) of an existing facility as a backup to the prime site will be procured as part of the Systems Integrator solicitation.

2. Our approach will be to prepare the criteria for the Upgrade Facility that will be designed and built by the Systems Integrator. We will then prepare the Pre-schematic Design for the New Prime Site so the Systems Integrator will provide the final design and construction. We will provide design and layout review.

3. After the existing facility is upgraded, network control will be installed in that facility. Building the new facility will likely take a longer period of time. When the new building is complete the prime site network control function will be transferred there. The new facility will house the new statewide system network control equipment. The upgraded existing facility will remain the backup network control site. It is important that the Systems Integrator and their A-E that is responsible for preparation of contract documents be aware of the critical need for expeditious preparation of the design documents.

E1.01 Prime Site Criteria Development Process (New Facility)

Hayes, Seay, Mattern and Mattern will determine the communications equipment required for the Prime Site housed in the new building. We will prepare a narrative of performance standards and criteria for the Prime Site that will support the statewide system. In the event that it is not possible to establish firm equipment and system requirements at this point in the project, we will discuss design assumptions with the Virginia Project Manager and present a conceptual design and

equipment list. These criteria will serve as the basis for design for the communications equipment area of the new building.

HSMM will provide design workshops, meeting with the users of the New Facility to develop the floor plan and specific space requirements for each of the individuals and functions that will be housed in the building. HSMM will also prepare the pre-schematic design for the facility including the exterior elevations that will establish the appearance and relationships that building will have with other buildings on the site.

The above design will be presented in the solicitation. The Systems Integrator will complete the design development, construction documents, and construction in accordance with Commonwealth procedures. The VSP Data Processing Division will be responsible for obtaining and installing additional CAD terminals for the new positions. It will be the responsibility of the Systems Integrator to coordinate with the VSP Data Processing Division to schedule this installation.

HSMM will assist the Commonwealth in the review of the design by the Systems Integrator. We will review and comment on the Schematic, Design Development, layout and Final Submittals. We envision there will be a maximum of two proposals to be evaluated in detail. Should additional proposals be received, a screening process agreed upon beforehand will be used to eliminate the least viable proposals, to the extent that a maximum of two remain. HSMM will conduct a detailed review of additional proposals at the Commonwealth's option, and as an additional service.

HSMM will assist the Commonwealth in technical negotiations with up to two Systems Integrator Offerors concurrently (Competitive Negotiation). We will, at the Commonwealth's option and as an additional service, assist the Commonwealth in competitive negotiations with additional candidates. Face-to-face technical negotiations with the Systems Integrator Offerors would be conducted in Richmond. Under this scenario, we envision three review meetings in Richmond.

E1.02 Prime Site Criteria Development Process (Renovation of Existing Facility)

Hayes, Seay, Mattern and Mattern will determine the communications equipment required for the Prime Site to support Phase 1. This equipment will be installed in the renovated existing facility in conjunction with the implementation of Phase 1. We anticipate that the new building will be complete in time for the implementation of Phase 2.

At that time, new equipment will be installed in the new building, and network control will be transferred to that location. The existing building and the network control equipment installed there will be retained as an active backup.

We will prepare a narrative of performance standards and criteria for the renovation of the existing building. These criteria will serve as the basis for design of the renovation for the communications equipment area of the existing building to be used by the Systems Integrator. These criteria will be combined with the criteria for the new building from Task E1.01 for presentation to the building design A-E.

HSMM will assist the Commonwealth in the review of the design by the Systems Integrator. We will review and comment on the Schematic, Layout, Design Development and Final Submittal. We envision there will be a maximum of two proposals to be evaluated in detail. HSMM will

conduct a detailed review of additional proposals at the Commonwealth's option, and as an additional service.

HSMM will assist the Commonwealth in technical negotiations with up to two Systems Integrator Offerors concurrently (Competitive Negotiation). We will, at the Commonwealth's option and as an additional service, assist the Commonwealth in competitive negotiations with additional candidates. Face-to-face technical negotiations with the Systems Integrator Offerors would be conducted in Richmond. Under this scenario, we envision three review meetings in Richmond.

E1.03 New Facility Program of Space Needs Report

HSMM will combine the information from Tasks E1.01 and E2.01 into a single report. We will include a Pre-schematic Design for the New Prime Site that will allow the Systems Integrator to provide the final design and construction. This information will be included in the functional specification for use as a basis of design of the two facilities. We will meet with the A-E to discuss the report and to answer questions. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

E1.04 New Facility Transfer of Network Operation

Concurrent with implementation of the first phase of the LMR project, network control equipment will be installed at the Prime Site in the upgraded (renovated) existing facility. During optimization and test of Phase 1, the network control equipment will be part of the test. When the new building is completed and the equipment is installed, primary operation will be transferred to the new site.

The plan is contained within Schedule Blocks 15100, 15200. Cutover of the VSP to the new system will be concurrent to the transfer of network operations to the new Prime Site. The work for this subtask will be part of Task G3.

E1.101 (Not Used)

E1.102 Upgrade VSP Communications Centers

HSMM will prepare the functional criteria for the upgrade of seven VSP communications centers located at the Divisional HQs. The Systems Integrator will be responsible for the detailed design and implementation of the upgrade.

HSMM will determine the renovations and/or additions required at each of the centers to increase the number of dispatch/call taker positions to eight. We will prepare a narrative of performance standards and criteria for the renovation and/or addition at each location. These criteria will serve as the basis for design for the communication centers to be used by the Systems Integrator.

HSMM will assist the Commonwealth in the review of the design by the Systems Integrator. We will review and comment on the Schematic, Design Development, layout and Final Submittals. We envision there will be a maximum of two proposals to be evaluated in detail. HSMM will

conduct a detailed review of additional proposals at the Commonwealth's option, and as an additional service.

HSMM will assist the Commonwealth in technical negotiations with up to two Systems Integrator Offerors concurrently (Competitive Negotiation). We will, at the Commonwealth's option and as an additional service, assist the Commonwealth in competitive negotiations with additional candidates. Face-to-face technical negotiations with the Systems Integrator Offerors would be conducted in Richmond. Under this scenario, we envision three review meetings in Richmond.

Task F

F. The contractor shall prepare a plan for the Commonwealth to migrate to this new LMR technology and continue to interoperate throughout the state through the migration period. The migration shall allow units that have not been upgraded to communicate throughout the Commonwealth. The migration plan shall consider the operation of the present vehicular repeater (Motorola PAC-RT and General Electric MASTER Executive II both with high-band detectors) and mobile data.

The following items are part of Modification #3:

The contractor shall, with the assistance of and review by the participating agencies, develop the structure of the migration plan. The contractor shall include in the functional specification requirements for the SI to develop a detailed cutover/migration plan.

The Systems Integrator will, under the contractor's oversight, produce and update the detailed migration plan and ID format. The COV will review the plan and ID format, and upon agreement, will provide acceptance of the plan. The Contractor shall work with the SI to update the migration plan annually and review this updated plan with the participating agencies.

The following sub-tasks address the work requirements for the above RFP Task.

F. Migration Plan/Strategy

The VPSLMRN system encompasses the entire landmass (and territorial waters) of the Commonwealth of Virginia, and involves transition of 19 state agencies from their current operating situation to the new system. This transition is nearly as complex as the system, and to appear substantially seamless to the users, must be planned carefully. Not only are we concerned with regional transition, where the implementation is in phases (VSP Division driven), but we are also concerned with agency transition. The agencies have operational boundaries that probably do not coincide with those of the VSP, and therefore even though the majority of a particular agency division may be capable of the transition, the part that is outside the implemented infrastructure cannot move until the infrastructure is complete in that area. Therefore, any sites necessary to provide service to a VSP division shall be upgraded with that division.

An additional layer on this problem is the fact that some of the frequencies to be used in the system will come from these agencies. The incumbent agencies cannot relinquish these frequencies until they are able to migrate to the new system.

The migration plan may therefore have two aspects. The first would be the migration of VSP by phases, with VSP divisions moving to the new system, as each phase is complete. Some agencies may be able to migrate at this time as well. The second migration would occur after all the sites are in, and the system is up and running. This would entail migration of one or several agencies, and then integration of their frequencies into the existing sites which would increase the capacity of the system to accept more agencies, who would then release frequencies, and so on.

We therefore view the migration plan as a three-part process. The first is to develop a structure and general plan. This is done early, and encompasses the entire state. The second is to develop updates to the plan, which necessarily will occur in conjunction with the phased implementation. In succeeding sections we describe how we plan to do this.

The third part is to migrate the agencies to the system after the infrastructure is complete. This aspect is dependent on the frequency plan (which has not yet been developed), which is in turn dependent on the technology (which has not yet been selected) and the coverage design (which has not yet been accomplished). It is therefore premature at this time to speculate about the impact that the Migration plan will have on either the schedule or the scope. We anticipate that this issue will be addressed as part of the initial migration planning effort.

The use of vehicular repeaters is an important part of a wide area radio system that is designed to provide mobile radio coverage. Vehicular repeaters are the only way to consistently obtain portable radio communications inside buildings and to the user that is on foot. We recognize vehicular repeater technology has not moved forward significantly in the past 10 to 15 years.

With respect to mobile data, we intend to include current and future mobile data requirements in the migration strategy. This means taking the 500 existing VSP units, 80 existing DMME (Department of Mines, Mineral, and Energy) units, and the 12 existing DEQ (Department of Environmental Quality) units discussed elsewhere in this scope and applying them to the new system, and also taking into account the new units that are anticipated as part of this procurement.

Section F.02 Paragraph 1, “Inventory records of existing equipment” includes these mobile data units. The migration plan will consider operation of the present equipment: vehicular repeaters, mobile data units, as well as other non-fixed and fixed infrastructure that may be reused. This equipment must be carefully tracked - - so that the impact of the transition on current users is minimized.

F.01 Prepare Initial Migration Plan

HSMM will develop a strategic phased migration plan for both hardware migration and operational migration for the 19 identified agencies. Integral to this plan will be the participation of the Agency Representatives identified in the Needs Assessment process. We will also develop the required inter-divisional and interagency interoperability procedures. We will initially work with the Systems Integrator to prepare a draft of the migration plan and provide twenty-two copies of the draft to the Commonwealth representatives. There will be two review meetings in Richmond to adjust and include Commonwealth comments in the draft.

Twenty-two bound copies and one unbound copy of the final Migration Plan will then be submitted to the Commonwealth. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part. The plan at this point is by necessity general. Specific migration instructions or “cutover” will be established as part of the implementation of each phase under Task G.

F.02 Continuing Year Migration Plans

The Commonwealth will require the Systems Integrator to assist with the update of the migration plans as conditions change, and at least annually. HSMM will review each migration plan update, and will work with the Systems Integrator in a series of meetings and review cycles the intent of which is to minimize the impact of migration on each participating agency, while bringing that agency on line on the system in an expedient manner consistent with the agency's operational situation.

In cooperation with the Richmond Division, (and then each succeeding Divisions as the system is implemented) and the state agency representatives, HSMM will develop new operating procedures for use on the new radio system for the Richmond and succeeding Divisions. This will include interagency and interdivisional procedures as well. Transitional plans for use during the 'cutover' will be created for all agencies. Train the trainer training will be provided at the VSP Academy in Richmond on the new procedures and the transitional procedures. The Commonwealth will train users as required. As part of this plan HSMM will require users to sign a receipt for new equipment and disposition of the old equipment. Installation of the new fixed and subscriber equipment will be planned around the needs of the user agencies.

F.101 Migration Plan Specification

HSMM will develop a functional specification that will require the Systems Integrator Offeror to develop a detailed migration/cutover plan as part of their proposal based on the strategic phased migration plan produced under subtask F.01, and tailored to the Systems Integrator's specific technology.

HSMM will develop a Systems Integrator Offeror evaluation category that will consider the schedule for migration for each agency, as well as the ability of the Systems Integrator to support a migration plan with minimal operational effect on each agency.

F.102 ID Assignment

HSMM will include a requirement in the functional specification that the Systems Integrator develop an internal system identification number format. This numbering format will contain internal specific agency and divisional identifiers. The identification numbering format will be designed for application statewide and to all participating FLEWUG users. HSMM will review the system identification format when it is initially developed, and then will review the adherence to this format in assignment of numbers as the implementation progresses. This format must be flexible and expandable, in order to accommodate the inclusion of agencies and user groups that may be added later.

It also must accommodate the requirements placed on the system by third party users that may be included for generation of revenue, in such a manner that the third party users do not impact the operational capability of the system for the purpose and mission of the Commonwealth user agencies. In our experience this is an important step that is often overlooked. It is important to establish an ID numbering structure in advance that will take into account future as well as present requirements. In the absence of a well-considered structure, IDs are assigned on an ad-hoc basis, which becomes confused and complicated later, with commensurate loss of

effectiveness of personnel resources. Refer to Section B2 for more details on Talk-group and user ID planning.

F.103 User Evaluation Period (UEP)

For a period of 90 days after each division cutover to the new system there will be a User Evaluation process developed and overseen by HSMM. Through a process of interviews and specifically designed forms, we will obtain and collate the problems perceived by the users. These concerns will be responded to and applied to future system acceptance, migration plans, and training. We have found that this UEP process, which proactively solicits user response, is an extremely important part of user acceptance of the system.

Task G

G. The contractor shall design an upgrade to the existing State Police LMR and microwave networks that will have the capacity necessary to support the Commonwealth's projected requirements for ten years. The upgraded network shall provide at least 95 percent contour reliability and 98.3 percent area reliability for mobile radio coverage (geographically) and in the Virginia territorial seas. The contractor shall develop, plan, and document any new transmitter sites or microwave sites that are necessary to achieve the required coverage. Properties owned by the Commonwealth shall be considered first for additional transmitter sites. The contractor's design shall develop options that will increase the coverage reliability. The contractor shall consider the use of existing radio assets when it is technically possible and the equipment is of satisfactory condition and quality. The contractor shall investigate the impact on coverage when the gain of the mobile antenna is reduced from 3dB to achieve a larger bandwidth or smaller physical size. The contractor shall create the required technical procurement documentation to purchase the equipment, software, and installation for this upgrade. A vehicular repeater shall be used to provide extended portable coverage. The contractor shall include in the procurement documentation the necessary test equipment and training for the Commonwealth's technical staff to maintain and repair the hardware and software. The procurement documentation shall also include a provision for a term contract for several tiers of compatible mobile and portable radios and accessories that can be used by future users of the LMR network. The contractor's design shall facilitate independent dispatching by each of the participating agencies.

When designing the microwave network upgrade, the contractor should consider potential frequency relocations. If at that time, there is a potential relocation at a specific site, the VSP will negotiate the conditions based upon the contractor's design. The contractor shall assess whether the existing microwave network is adequate to serve the projected traffic needs and recommend expansion or replacement as appropriate.

The contractor shall submit a report, which documents the designed coverage of the network and any infrastructure changes that are required to accomplish the required mobile coverage. The Commonwealth may determine that a proposed site is not necessary and that the specified coverage in a specific area is not required. However, portable radio coverage may be required in other specified areas. System coverage must adhere to agreements with the National Radio Astronomy Observatory.

The contractor shall develop a radio coverage acceptance test plan.

The Offeror's proposal should describe how the test plan will consider: the static receiver threshold (Gaussian environment) the faded receiver threshold (Rayleigh environment); lognormal fading; number of tiles; number of samples per tile; size of the tiles; and voice quality in an interference limited system.

The contractor shall perform coverage mapping on the completed upgrade using Survey Technologies Incorporated Mobile Signal Analysis System with the Tile Analysis Software option (or equivalent) for 98.3 percent coverage verification purposes.

The following items were agreed upon during negotiations:

The term contract, for several tiers of compatible mobile and portable radios, shall meet the requirements of the individual agencies identified in the "needs assessment" task.

To facilitate new LMR sites and the creation of microwave backbone loops (for redundancy), 24 new microwave hops, half of which may need new sites, should be considered to the extent described herein.

No radio equipment will be ordered by the Commonwealth without the possession of the associated Radio Station Authorizations issued by the Federal Communications Commission. The contractor shall schedule the project's tasks in accordance with this requirement.

The following items are part of Modification #3:

The required reliability has changed from 98.3% to 95%. Increase the number of LMR sites to 47. The sites at the Warrenton Training Center (View Tree) and Quantico will be installed and maintained by VSP technical staff.

The contractor shall prepare a functional specification to use a single vendor (Systems Integrator, SI) to be responsible for detailed design, furnishing, implementation, and proof of performance of all systems and work required for the upgrade. This will include the following subsystems:

- ***The LMR subsystem (fixed plant infrastructure and non-fixed equipment)***
- ***The Microwave subsystem***
- ***The Mobile Data subsystem***
- ***The Intranet subsystem***
- ***The supporting physical facilities (sites, towers, etc.)***
- ***The new and upgraded Control facilities and seven VSP Communications Centers***

Expand the functional specification to include the following scenarios:

- ***COV ownership of the infrastructure, non-fixed equipment, transmitter sites, and two control facilities, COV maintenance of these equipments, sites, and facilities (SI to equip and train COV to perform the required operations and maintenance tasks); and COV operation and maintenance of the system.***

- ***SI ownership of the transmitter sites (including towers and land), infrastructure, non-fixed equipment, and two network control facilities (the seven VSP Division Communication Centers are not included); SI maintenance of these sites, equipments, communications centers, and facilities; and SI operation of the system with COV oversight. Ownership of the sites and facilities will revert back to the Commonwealth at the conclusion of the contract.***

Expand the functional specification to include detailed pricing for both scenarios to be differentiated by the Offerors.

The Contractor shall identify fixed-end system access locations for each of the 19 Participating Agencies, and shall provide for this access and the network necessary to support the access.

Assist the COV in acquiring additional radio frequencies in VHF, UHF, and 800 MHz and microwave, as well as licensing of narrowband VHF mobile frequencies.

The contractor shall provide a detailed technical evaluation for up to two SI Offeror proposals, with an option to add SI proposal evaluation under the direction of the Commonwealth as an additional service.

The contractor shall assist the Commonwealth in a competitive negotiation process with up to two short listed SI Offerors. Include changes to reflect a competitive procurement negotiation between two short listed offerors, rather than the competitive evaluation process currently in the contract. A provision for additional offerors will also be added.

The contractor shall develop and maintain a database of transmitter sites located on Commonwealth property and available for revenue generation including Commonwealth owned, leased, and commercially owned facilities. Document the current participating agency sites that are not used in the infrastructure, with the intent of using them as revenue sources. This shall also include commercial sites currently in use and/or generating revenues.

The system shall support COGMARS, IFLOWS, CAPWIN, LOJAK, TCAP, PMARS, and SIRS to the extent the networks have been defined, documented and provided to the Commonwealth.

HSMM shall allow potential offerors to view the draft RFP in its Lynchburg office approximately one month in advance of issuance. This will afford potential offerors the ability to review the draft RFP for them to determine if they meet the objectives of the RFP and to obtain their comments.

The following sub-tasks address the scope of work for the above RFP Task.

G. Communications Functional System Design, Procurement and Implementation

Task G comprises three distinct components. The first component, which we have numbered Task G1, is the Functional Design component. Here we take the system technologies that have been reviewed as part of Task D, and concurrent with the frequency planning that is being done as part of Task B, we prepare a preliminary, or "baseline" design of a state-wide system for Virginia, against which proposals received will be evaluated. The second component, which we have numbered Task G2, is the Functional Procurement component. Here we convert the baseline design into a Systems Integrator functional specification, and prepare the technical procurement documents for issuance by the Commonwealth, including also the specifications developed under Task E Control facilities – (Renovation and New); Task F (Migration Plan); Task H (Network Interface); Task I (Site development and Tower Renovation); and Task J (MCTs and Intranet). We then assist the COV in the evaluation of up to two responses, recommend a course of action, and assist the Commonwealth in competitive negotiation with up to two Systems Integrator Offerors. The third component, which we have numbered Task G3, is the Implementation component. This will be done in phases, where the first phase will be the Richmond area. This includes installation of the equipment, optimizing of the system, and acceptance testing. Coverage acceptance testing is contained in Task G3, while equipment and system acceptance testing is part of Task K.

The intent of the Commonwealth is to procure the entire system from a single source, termed herein the Systems Integrator. The Systems Integrator may be a radio system vendor acting as a prime contractor with a number of subcontractors and equipment sources, or it may refer to the vendor with lead responsibility and directing a team of associates in complementary disciplines. To this end, HSMM will produce an integrated solicitation package. This package will be functional in nature, allowing different system technologies to compete on a cost basis, while maintaining the Commonwealth's ability to control the reliability, service levels, operational attributes, flexibility, and maintenance level of the system over the entire life of the system. The package will also allow reasonable differentiation in the evaluation of the various Systems Integrator Offerors' proposals so that the Commonwealth can make an assessment of the value of each offering as compared to life cycle cost.

The integrated functional specifications are the foundation of the project. They provide the following:

- The technical part of the procurement documents, in order to provide the basis for the Systems Integrator Offeror proposal as well as the basis for evaluation of the Systems Integrator Offeror proposals.

- The technical part of the contract, as negotiated and agreed to by the Commonwealth.

- The "road map" for implementation, such that the project includes oversight "windows" which provide for inspections, reviews, meetings, reporting, and project documentation. Also to include oversight provisions to provide for changes in functional requirements, and other technical changes that may be required as the implementation progresses.

- The basis for acceptance, to make provisions that the system performs as specified, and according to good engineering design principles.

- The baseline for Systems Integrator operations for the life of a potential Commonwealth/Systems Integrator partnership, presumably lasting up to 20 years. Includes protection for Commonwealth in the event of conflicts between Commonwealth agency's mission requirements, and the Systems Integrator's commercial needs.

The functional specifications package that HSMM will produce for this procurement is, therefore, not simply a procurement document. It is the foundation, or baseline document that will form the technical part of the contract with the Systems Integrator, and it will be the definitive document for the implementation of the project, the acceptance of the project, and operation for the life of the project, which may be in excess of twenty years. The integrity and completeness of this single document is critical to the success of the project.

G1. Functional Design

G1.01 Design VPSLMR Network Upgrade

The functional design process and Task D will necessarily be done in parallel and in the same general time frame. HSMM preliminary design effort will begin earlier, specifically the microwave system engineering and LMR system coverage analysis. Coverage analysis and preliminary design must be done concurrent with the frequency planning in Task B.

We will begin with an initialization meeting, which will include the Virginia Project Manager as well as all members of the HSMM team. Prior to convening the initialization meeting, we will have provided a letter describing the information people will need to be prepared to discuss at the meeting. We will document the meeting with a meeting record.

From the needs assessment information, we will determine the requirements of the 19 state agencies, operational boundaries, needs for statewide or cross divisional communications and dispatch, inter-zone roaming, aircraft (fixed-wing, rotary-wing, military) communications, and system management requirements.

From the System Technologies Assessment information that has been obtained by that date, we will identify reasonably achievable design parameters. We will use the current licenses as the basis for the baseline system design, with sites added to enhance coverage according to the processes described below.

We will use this information to develop a conceptual architecture for the system, which we will analyze for loading, and will use to update the Master Budget, part of Task L. We will provide to the Commonwealth a Draft System Architecture report. After receipt of Commonwealth comments, we will finalize the report and provide 20 bound copies and one unbound copy to the Commonwealth. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

G1.02 Microwave System Design

Concurrent with the LMR design task, we will develop a preliminary design for the microwave (MW) system using the LMR sites identified as necessary in the coverage analysis. This process begins with an assessment of traffic loading requirements, which will include both the requirements placed on the MW network by the LMR system and external requirements that might be placed on the network by various agencies. We will include agency requirements to the extent they are received by HSMM in a timely fashion. We will also include the loading anticipated as a result of the Intranet designed and implemented as part of Task J.

The LMR coverage analysis process will result in a preliminary location of radio sites. These sites will be used to establish a preliminary MW routing plan, which will be prepared and refined with capacity, route redundancy and failure considerations in mind. We note that failure in a microwave system includes the possibility of equipment failure, and path failures that result from propagation anomalies – mainly due to weather events, ducting (in coastal areas) and spurious reflections.

As part of this task we will incorporate the 19 Participating Agencies' fixed access locations, to the extent identified by the agencies, as part of J2.01 into the microwave network system design. We will review additional loading requirements resulting from these access locations, to the extent such requirements are presented to us in a timely fashion, and will incorporate them into the Microwave Routing and Channel Plans.

The routing plan, which will use as many current VSP microwave sites and links as reasonably possible, will identify the need for new or relocated sites. Each of the new or relocated paths will then be analyzed, resulting in an engineering path design. We will develop a microwave channel plan that will be provided in draft form to the Commonwealth. We will then review the plan with

the Virginia Project Manager, and will provide the channel plan in final format with six bound copies and one unbound copy. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

G1.03 Coverage Analysis and Documentation

HSMM will first conduct a Computerized Propagation Analysis for the existing 47 LMR sites comprising the VSP network, using the reasonably achievable design parameters established during the technologies assessment. Using this information, we will identify areas where coverage is projected to be inadequate. The coverage analysis will be based on the use of mobile radios throughout the Commonwealth, and will take into consideration local terrain, restrictions placed by the FCC in parts of the Commonwealth, and the signal levels required for a high capacity VHF system (the baseline system) to operate correctly. We note that part of Task D will be to ascertain the necessary design levels for various types of VHF system technologies both trunked and conventional.

We also note that the Capitol Police will require in-building coverage, as will the areas in and around the following tunnels: Big Walker Mountain; Hampton Roads; Elizabeth River Downtown; Elizabeth River Midtown; Chesapeake Bay Bridge (N); Chesapeake Bay Bridge (S); Monitor/ Merrimack; East River Mountain.

We recognize that there will be a number of antenna configurations and locations on vehicles for the users of this system. We will design the system to be able to accommodate antenna gains and locations that are less than optimum. This will include antennas that have 3 dB less gain than standard antennas, alternate mounting locations (for example the fender cowl or the rear deck), reduced gain antennas (such as disguised antennas), and the use of antennas on less than optimum mounting surfaces (such as a light bar).

Coverage design will take into consideration the coverage recommendations of TSB-88, which is the Telecommunications Industry Association (TIA) report on Wireless Communications Systems Performance (Radio Coverage). We will initially design coverage to the availability level of 95% (mobile radios outside buildings). We will review this design parameter with the Commonwealth after the first pass of coverage analysis, to determine if the design target should remain at that level or be modified in order to address the operational needs and the budgetary constraints of the Commonwealth.

We recognize that a system that is designed for mobile radio coverage outside buildings (except for the Capital Police in the Richmond area) will not provide sufficient signal for the universal use of portable radios area. There are however, a number of agencies that require the use of portable radios. In order to economically design a system within reasonable fiscal constraints, the use of a vehicle-based repeater will be necessary.

A mobile coverage design provides coverage identical to that expected between a vehicular repeater and the fixed equipment. Coverage between the portable radio and the vehicular repeater is not a design parameter of this radio system.

Our coverage analysis facility, the Softwrite Terrain Analysis Program (TAP), uses a computerized Longley-Rice model applied to terrain data obtained from the USGS 3-second terrain database. Softwrite has developed the model, in partnership with HSMM. HSMM incorporates this model into a wide–area model developed by HSMM, to determine the projected

coverage produced by multiple communications sites working statistically together to provide the requisite coverage. Results are crosschecked against 7-1/2 minute USGS maps of the area, to minimize the effect of terrain anomalies.

G1.04 Assess Quiet Zone Impact

As part of our analysis we will take into consideration the effects of incorporating FCC restrictions associated with the National Radio Astronomy Observatory (NRAO) in Green Bank, WV. We note that the current VSP sites are "grandfathered" into the Quiet Zone. We will consider these "grandfather agreements" and any other coordination documents in our baseline design, and will specify that the Systems Integrator adhere to these agreements in their detailed design.

G1.05 Submit Coverage Analysis Report

We will incorporate the new sites identified into the propagation analysis, review the analysis with the Commonwealth, and provide a report to the Commonwealth. We will provide two copies of the report in draft form, and six bound copies in final form. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

G1.06 Review Coverage with Commonwealth

Prior to delivery of the draft report, we will meet with the Commonwealth to discuss the coverage determined to that point, and to identify additional sites that might be reasonable for extending coverage into areas where additional coverage levels may be desired. We anticipate focusing first on using existing VSP sites, then on radio sites used by other agencies, then on Commonwealth owned land, and then on existing non-Commonwealth owned radio sites. If sites are still needed, we will work with the Commonwealth to identify potential undeveloped radio sites.

In the design of any wide area two-way radio system design, there is a tradeoff between coverage and cost. We plan to meet regularly with the COV Project Manager in order to discuss our coverage and cost estimates, to identify locations and areas that need additional coverage, to establish the cost of providing that coverage and relate that cost to the agency requiring it. In this way we expect to optimize, to the extent possible, the coverage as a function of cost for the Commonwealth. We expect this to be a give and take process that involves the affected agencies. The point at which this process is agreed to be completed, so that the functional specifications and procurement may be finalized is provided as a milestone in an agreed to project plan (Operational Requirements Finalized). Extending coverage into areas in which it is deficient means that one of the following three processes must occur:

- adding a new site;
- relocating an existing site;
- adjusting site parameters (such as tower height, antenna pattern, etc.).

We will work with the Commonwealth to optimize these procedures to the extent possible. We note that coverage requirements may be different for VSP and for the other agencies.

G1.07 Document New Sites Required, Assist in Frequency Acquisition

For this task only, HSMM has estimated, using currently available documentation and analyses, that there may be as many as 38 new radio sites necessary in order to provide mobile radio coverage to the level described in the RFP documentation. We generally have found that in a design situation for a multiple site radio system we need to develop coverage studies for more sites than those actually included in the final system design. This amounts to approximately 30% excess, to accommodate potential sites that do not turn out to work adequately with other sites. Taking these factors into consideration, this scope of work includes 50 additional coverage analyses for the VHF design, which should be sufficient to accommodate a requirement for approximately 38 new sites. Should the design requirements be such that additional sites beyond the 50 provided are required, or should the Commonwealth specifically request additional sites beyond the 50 be reviewed, we will work with the Virginia project manager to reach an agreement for an adjustment in scope, schedule and fee.

As part of establishing the site requirements, we will develop an opinion of the probable cost for the new sites, and incorporate those costs into the Master Budget developed as part of Task L.

For the purposes of this scope of work, identification of new radio sites is based solely on coverage considerations. While we recognize that actual siting will require consideration of other factors such as, availability of real estate, environmental impact, and legal issues concerning the lease or sale of property, these factors cannot be ascertained in advance. Additional coverage analyses as a result of relocating sites for reasons other than system design considerations can be done at the option of, and under the direction of the Commonwealth.

In addition, HSMM will provide the Commonwealth assistance in acquiring additional radio frequencies and in licensing of frequencies, including researching the availability of LMR frequencies specifically available for each radio site (up to once for each of the 47 LMR radio sites), identification of Microwave frequencies (up to once for every two Microwave paths – assuming 50% of the microwave licenses will require no changes), and licensing VHF narrow-band frequencies for backup communications (up to four frequencies at each LMR site on a one-time licensing basis). Assist the COV in acquiring additional radio frequencies in VHF, UHF, 700 MHz, and 800 MHz for use in transportable LMR networks and mobile data.

G1.08 Calibration of Propagation Model

Propagation models are by nature generally predictive devices. In an effort to tailor the TAP model to Virginia's terrain, and to take into consideration the variations in antenna patterns resulting from tower size, shadowing, etc., we will take various measurements from several VSP sites. Since the existing VSPHQ tower site in Richmond (the Test Bed Site) is reasonably representative of Virginia terrain; we will base our Virginia terrain calibration on that site and incorporate the information into the TAP program.

We will take measurements in the vicinity of a maximum of five VSP sites (including the VSPHQ tower site), for the purpose of modeling the antenna pattern(s) at that site. The sites will be selected to demonstrate tower size variation, shadowing from other devices on the tower, etc. We envision that these measurements will occur over the period of five weeks.

For each VSP site measured, we will run propagation analyses using a Longley-Rice based analysis tool. We will characterize the area surrounding the site by tile, establishing

characteristics such as vegetation, terrain variance, etc. We will then measure the signal levels provided by the analog VHF test bed equipment, and compare these signal levels with those predicted by the model. By identifying variations between the measured and predicted performance (both variations in central tendency and in variances), and correlating these variations with the tile characteristics, we can establish a calibration matrix of dB factors applicable to the test bed site. We can then apply these dB factors to other sites using the same model, for the characteristics identified. We note that transference of these dB factors from the measurement site to another site is not a precise process, and therefore there will be a statistical adjustment that will need to be included in the predictions to accommodate the differences between sites.

The specific process we intend to use in the calibration effort will include the following:

- The Commonwealth and HSMM will agree on appropriate existing VSP sites.
- The Commonwealth will install Commonwealth supplied VHF conventional system equipment and an antenna system at the site, or we will use the existing equipment.
- We will test each site for the parameters required.
- The test data will be used to calibrate the computerized propagation analysis model described in Task G1.03.

G1.101 Microwave Field Surveys

HSMM will include in the functional specification that the Systems Integrator perform Microwave Field Surveys.

G1.102 (Not Used)

G1.103 Identify Commonwealth Properties

Should the search for new tower sites extend beyond the use of Commonwealth properties, we will assist the Commonwealth in identifying such properties and in evaluating their suitability for use. This might entail a physical survey, lease research, ownership research, environmental impact study, zoning application preparation, and many other possible items. This scope of work includes this service on a time and material basis.

G1.104 Simulcast Communications Zone Coverage Analysis

We anticipate that the general design of the VPSLMRN will be of multiple site and simulcast communications zone operation, with each site having a frequency set different from the adjacent communications zone. We also anticipate that there will be at least one location (Richmond) where there will be an in-building coverage requirement to serve agencies such as the Capitol Police as well as eight tunnels (Big Walker Mountain; Hampton Roads; Elizabeth River Downtown; Elizabeth River Midtown; Chesapeake Bay Bridge (N); Chesapeake Bay Bridge (S); Monitor/ Merrimack; East River Mountain). We may assume that, in those areas with higher-level coverage requirements, a simulcast approach may be recommended. We therefore include in this scope of work simulcast analyses for two areas for the purpose of providing in-building coverage, each of which consists of up to ten simulcast sites. This will include development of an opinion of probable cost for use in the Master Budget developed as part of Task L.

G2. Functional Procurement

The VPSLMRN will be a large and complex communications system, and will very likely use technology in applications not in operation in this country and may have some proprietary elements. This scope of work will, therefore, use a functional procurement approach, where we carefully design the requirements for the system, and then evaluate Systems Integrator Offerors' proposals in response to those functional requirements. Each Systems Integrator Offeror proposal might use different configurations or protocols, but each proposal must provide for the functional needs of the Commonwealth and meet the performance specifications to be considered. The integrated functional specifications will require the Systems Integrator to provide ownership and operational options to comply with the two identified Commonwealth scenarios:

1. COV ownership of the infrastructure, non-fixed equipment, transmitter sites, and two control facilities, COV maintenance of these equipments, sites, and facilities (SI to equip and train COV to perform the required operations and maintenance tasks); and COV operation and maintenance of the system.

2. SI ownership of the transmitter sites (including towers and land), infrastructure, non-fixed equipment, and two network control facilities (the seven VSP Division Communication Centers are not included); SI maintenance of these sites, equipments, communications centers, and facilities; and SI operation of the system with COV oversight. Ownership of the sites and facilities will revert back to the Commonwealth at the conclusion of the contract.

The integrated functional specification will also require the Systems Integrator Offerors to provide a detailed proposal for Scenario 1, including elemental prices for each ownership, maintenance, and operational situation and Scenario 2, including elemental "per seat" prices for each ownership, maintenance, and operational situation

HSMM will establish a list of the current participating agency sites that are not used in the infrastructure with the intent of using them as revenue sources. This shall also include commercial sites currently in use and/or generating revenues. Identification of the sites will be completed via a request to the participating agencies.

The functional specifications package HSMM will produce for this procurement is not simply a procurement document. It is the foundation, or baseline document that will form the technical part of the contract with the Systems Integrator, and it will be the definitive document for the implementation of the project, the acceptance of the project, and the operation of the project for the life of the project, which may be in excess of twenty years. The importance of this single document is critical to the success of the project.

The package will form the baseline for Systems Integrator operations for the life of any COV/Systems Integrator partnership, presumably lasting up to 20 years. As such it must address protection for COV in the event of conflicts between COV agency's mission requirements, Systems Integrator's commercial needs and the orderly termination of the partnership.

We describe in this scope of work, a procurement process that will allow and encourage innovation in such designs. We will review this process in detail with Commonwealth procurement officers to finalize a procedure that allows the process to occur within the

Commonwealth's procurement regulations. We note that it is essential to maintain careful records, and to maintain impartiality during this phase. The procurement process will have been defined prior to issuing the procurement documentation, and must be carefully and absolutely followed in order to minimize the possibility of Systems Integrator Offeror protest. Throughout this process, the Commonwealth will be the procuring agency, and HSMM will be acting in an advisory and assistance capacity.

The procurement process assumes a "Competitive Negotiation", with certain aspects of system design being specifically required, and others being described functionally in the specification.

The Required Functional Specification Evaluation will consider items such as the following:

- Current VSP sites as licensed are the baseline of the system, and must be used unless they are re-coordinated;
- The current licensed ERP at the sites may not be exceeded in any direction without re-coordination;
- The current licensed height above ground at the sites may not be exceeded;
- Quiet zone considerations (agreements) currently in place may not be exceeded;
- Coverage Test Plan

The Commonwealth will authorize the Systems Integrator to proceed with the project only after all LMR and Microwave sites are acquired, and all associated FCC and FAA permits, registrations, and licenses are issued.

The Functional Specification Evaluation will consider such items as:

- Coverage Guarantee, tested as described in the Coverage Test Plan;
- System Capacity, based on the number of units supported under given per unit loading criteria;
- Ability to provide the baseline functionality in areas such as wide area roaming; console/dispatch, site design;
- Terms and Conditions
- The ability to provide a smooth migration path that minimizes impact on user agencies, while expediting agency participation in the system;
- The ability to provide multiple sources for subscriber equipment
- Predictors that the Systems Integrator Offeror and the technology will be viable over the life of the system;
- Capacity of the Systems Integrator Offeror to manufacture and install the project on time and within budget;
- Maturity of the technology and the product line;
- Ability of the system design to act as a platform for identified and projected emerging technologies;
- Adaptability to simulcast, or other wide area technology with equivalent operational characteristics;
- Total life cycle cost to the Commonwealth, including items such as price, impact on other procurements, Commonwealth management effort, and use of Commonwealth resources;
- Commonwealth cash flow, or cost-to-schedule relationship, with the intent to minimize Commonwealth investment prior to user access to the system, and to maintain Commonwealth investment in proportion to the level of use the system affords the users;

- The degree to which the Commonwealth maintains control over critical aspects of the system during implementation and subsequent operation over the life of the system, including but not limited to reliability, service levels, operational attributes, flexibility, and maintenance level of the system over the entire life of the system;
- Schedule: the ability of the Systems Integrator Offeror to meet or exceed the milestone schedule set out by the Commonwealth.

While Functional Specification items, for the most part, will include baseline functional requirements, the Systems Integrator Offeror will be evaluated by HSMM on their ability to achieve (and in some cases exceed) the baseline functional specifications on a weighted scale and provide advice to the Commonwealth accordingly.

Throughout Task G2 and G3, HSMM assumes in this Scope of Work, that there will be a single Systems Integrator with a single point of responsibility. Additional procurements or additional vendors will result in a change of scope, and an adjustment in fee and schedule as described in G2.108 and G2.109.

HSMM shall provide the following in support of the procurements contemplated under this contract:

- Provide detailed/in-depth functional technical specifications (to include licensure; adherence to specific standards and regulatory requirements, etc.) to the project manager/contract officer in preparation of the solicitation document;
- Make recommendations for inclusion of any Special Terms and Conditions pertinent to the project;
- Provide a list of suggested Systems Integrators who are in the business of responding to such specific projects;
- Participate in the pre-proposal conference as a technical source in support of the project manager/contract officer;
- Prepare technical responses to questions/issues arising from the above conferences or resulting from the solicitation;
- Provide technical/cost evaluation support (of Systems Integrator Offeror responses) to the project manager/contract officer in the detailed review of up to two proposals;
- Participate with the Commonwealth in identifying and developing negotiation issues and strategies;
- Participate with the Commonwealth, as a technical expert, in the conduct of competitive negotiations with up to two Systems Integrator Offerors;
- Provide documentation support of the total solicitation and evaluation process leading up to contract award.

Portable coverage in non-Richmond locales will require additional design and infrastructure. This will be addressed in a future procurement phase after the initial system is implemented and has been in operation for some time and the existing coverage has been evaluated. HSMM will provide, as an addition to this scope, engineering and oversight for expansion of the system for this purpose.

Intranet access for agencies not currently addressed in this scope will require additional microwave links and equipment. This will be addressed in a future procurement phase after the initial implementation of the Intranet in that location. HSMM will provide, as an addition to this scope, engineering and oversight for expansion of the system for this purpose.

G2.01 Functional Specifications for LMR Upgrade

HSMM engineers are well qualified in system engineering and design, and we intend to accept full responsibility for the design of the system to functional performance specifications of the Commonwealth as described in this scope of work. The Systems Integrator's engineers, however, are uniquely qualified to do detailed site design and system integration design, since they have access to design information specific to the current revisions and versions of the equipment they work with. This information, at the detail design level, is not provided on a current basis to outside personnel either via documentation or training. The description contained in this sub-task section is based on HSMM providing functional, performance procurement specifications and the Systems Integrator's engineers developing the detailed design to meet these functional specifications under our review.

HSMM will provide preliminary design for the LMR system to the functional, performance design level. This will include baseline coverage, baseline antenna selection and placement, baseline antenna system, physical facilities and site preliminary design (including grounding design) for the purpose of evaluating Systems Integrator Offeror proposals and assisting in the oversight of implementation. This information will be retained as confidential by HSMM and will not be released to a third party unless authorized to do so in writing by the Commonwealth. HSMM will include a requirement in the functional specifications that the Systems Integrator perform detailed site-specific system and coverage design according to the technology that they have established as their primary technology.

HSMM will include a requirement in the functional specifications that the Systems Integrator, as part of their contract, perform detailed site design under our review as part of Task G3. This requirement include all design and engineering necessary to implement the preliminary design at that site, such as (but not restricted to) cabling, rack-ups, grounding connection, equipment ordering, equipment mounting, and initial hardware and subsystem check-out and level optimization.

HSMM will design each LMR subsystem to the functional preliminary design level. This will include network control, circuit routing, baseline capacity (including expansion), redundancy, site-to-site level interface, and baseline alarms and diagnostics. HSMM will include a requirement in the functional specifications that the Systems Integrator, as part of their contract, perform detailed subsystem design including (but not restricted to) network control equipment ordering, network integration and alignment, cabling, and rack-up and mounting.

In the event that the coverage requirements dictate a simulcast or other wide area subsystem design, HSMM will provide a baseline design for each site and simulcast cell as described above. We note that different technologies and different vendors' product lines will cause dramatically different design approaches to wide area and in-building operation. In general, this is caused by the effects of data rate, word length, and operational protocols on digital access, and the fact that simulcast operation is substantially dependent on a complex interaction between tower sites. A design might provide a signal level adequate for 95% radio coverage and still have access denied in a significant number of locations due to other factors.

In this area Systems Integrator experience is essential, and for this reason we will need to work with the Systems Integrator in the preliminary design stage for simulcast subsystems even prior to

the specification and proposal effort. We will specify, and require Systems Integrator conformance to the baseline simulcast or equivalent wide area performance requirements.

We have developed, over the years, a set of design specifications for wide area communications systems that has been updated regularly to address experience with specific vendors, during procurement, implementation, and test phases. We will tailor the specification package to the functional needs of the Commonwealth, finalize the system design, consolidate the list of non-fixed equipment, and assist the Commonwealth in the preparation of the procurement package.

G2.02 Microwave Upgrade Functional Specifications

HSMM engineers are well qualified in microwave system engineering and design, and we intend to accept full responsibility for the design of the system to the functional performance specifications of the Commonwealth for the microwave system as described in this scope of work. The Systems Integrator's engineers, however, are uniquely qualified to do detailed site design and system integration design, since they have access to design information specific to the current revisions and versions of the equipment they work with. This information, at the detail design level, is not provided on a current basis to outside personnel either via documentation or training.

The description contained in this sub-task section is based on HSMM providing functional, performance procurement specifications and the Systems Integrator's engineers developing the detailed design to meet these functional specifications under our review.

HSMM will prepare functional, performance procurement specifications for the agency system access locations, the microwave sites and microwave system performance of the LMR sites. The microwave network shall be planned to accommodate the future growth of the intranet. HSMM will survey the participating agencies and will facilitate their future needs in the preliminary microwave network design and the functional specification, to the extent the information is provided in a timely fashion.

HSMM will include a requirement in the functional specifications that the Systems Integrator, as part of their contract, perform detailed site-specific design under our review. This will include all design and engineering necessary to implement the HSMM preliminary design at that site, such as (but not restricted to) cabling, rack-ups, grounding connection, equipment ordering, equipment mounting, and initial hardware checkout and link optimization.

HSMM will prepare functional, performance procurement specifications for the microwave subsystem. This will include network control, circuit routing, capacity (including expansion), redundancy, link performance, and alarms and diagnostics.

HSMM will include a requirement in the functional specifications that the Systems Integrator, as part of their contract, perform detailed system design including (but not restricted to) network alarms, control, and supervision equipment ordering, network alignment, cabling, and rack-up and mounting at the network control location.

We envision that these functional specifications will be focused on the procurement of equipment similar to that used for the digital links of the current microwave network.

G2.03 Coverage Test Plan

Radio coverage is a key issue for the VPSLMRN. It is also an area where Systems Integrators have substantial differences of opinion in how coverage is to be measured. We suggest that the test philosophy presented inTSB-88 be used as a universal "leveling field" for the procurement documents. TSB-88 does not describe a test plan, but rather provides guidelines for testing.

While the Commonwealth's design goal is a baseline 95% coverage availability throughout the Commonwealth, HSMM will include a requirement in the functional specifications that the Systems Integrator Offeror's be responsible to guarantee a specified coverage availability throughout the Commonwealth. HSMM will also include a requirement in the functional specifications that as part of the procurement process, Systems Integrator Offeror's guarantees of coverage will ultimately be specified in the Systems Integrator/Commonwealth contract.

We will design the preliminary system to the Commonwealth's requirements, the functional specifications will establish this as a baseline, and the Coverage Test Plan included as part of the functional specifications will describe the conditions under which coverage will be demonstrated.

We note that the Systems Integrator Offeror may design their system to exceed 95% coverage when they are required to guarantee that coverage level. We will take this into account when we establish sites. Each Systems Integrator Offeror's approach to their coverage guarantees will vary according to a number of business decisions that they make at the time. This may mean, under certain circumstances, that they might require additional sites beyond those, which we deem as necessary to provide the requisite coverage. Under the procurement process envisioned in this scope, they would be required to use the sites established by the Commonwealth in advance, and to describe the level of coverage they would guarantee under that condition.

The procurement process described above takes this Systems Integrator Offeror response into consideration, and puts pressure on the Systems Integrator Offeror's to respond to baseline coverage requirements competitively. Should Systems Integrator Offeror's, as an alternate, propose additional sites to meet the requisite coverage, we will work as the Commonwealth's Project Manager to determine the impact of those sites, and the risk associated with a system that does not include those sites.

We include in this scope of work, the development of a coverage test plan as part of the functional procurement specifications. The test plan will address two components: verification tests by the Systems Integrator, as required in the functional specification, and confirmation tests on the basis of a valid statistical sample by HSMM.
We also understand that the Commonwealth may test some of the coverage independently. The system will be deemed satisfactory and accepted only if both the verification tests and the confirmation tests are passed. In the event there is a discrepancy between the verification tests and the confirmation tests, the discrepancy will be resolved before proceeding further.

We suggest that the specific test procedure, which includes specific test equipment to be used by the Systems Integrator for the verification tests, test routes, and documentation requirements, be reserved until later. Some elements of the test procedure may be included as part of the Systems Integrator/Commonwealth contract, and some elements (such as test routes) are best left to a time immediately prior to the acceptance test.

We will provide two copies of the test plan in draft form to the Commonwealth, will review the plan in a meeting with the Virginia Project Manager, and will include the final test plan in the procurement documents.

As we stated above, our general plan is to use TIA/EIA TSB-88 as a reference to define coverage terms and requirements. Since that document does not include a test plan per se, it will be incumbent on the test team to develop the specifics of the coverage acceptance test plan (CATP). The test plan will be designed to consider: the static receiver threshold (Gaussian environment) the faded receiver threshold (Rayleigh environment); lognormal fading; number of tiles; number of samples per tile; size of the tiles; and voice quality in an interference limited system.

HSMM's approach to preparation of a CATP is:

1. Static Receiver Threshold (Gaussian environment). This parameter is applicable only to fixed radios, such as control stations. The coverage requirements in HSMM functional, performance procurement specifications anticipate this condition, where a test is run over a specified period of time with the passing criteria set to a threshold value of field strength. This field strength is different than the threshold for the non-fixed mobile and portable radios.

2. Faded Receiver Threshold (Rayleigh environment). Generally, mobile and portable radios can be considered to be in motion, and Rayleigh fading becomes an important factor. The coverage requirements in HSMM's functional, performance procurement specifications give the threshold value for analog radios in terms of field strength (expressed in microvolts). The test for these values must be conducted in a moving vehicle where the median value is calculated from several hundred samples as the vehicle moves through 40 wavelengths. For digital performance, the bit error rate (BER) specified in TIA/EIA TSB-88 is used for the appropriate application. We note that there are different thresholds specified for public safety and other users.

3. Lognormal Fading. This is another mathematical distribution function (similar to Gaussian and Rayleigh) often used to describe stochastic processes. In a coverage test, the analytical model for describing the process is relegated to a secondary consideration, since the actual measured data would govern the results and the pass/fail criteria. Fading that assumes lognormal distribution would be tested in the same manner as Rayleigh fading for moving vehicles.

4. Number of Tiles. The portion of HSMM's functional, performance procurement specifications that deal with the CATP requires the coverage area to be divided into test zones (often on the order of 25 to 100 square miles). The local terrain or geopolitical boundaries often dictate logical test zones. HSMM will include a requirement in the functional specifications that the Systems Integrator guarantee coverage within each of the test zones. The specification will describe that the test zone is further divided into "tiles" or "grids" by the Systems Integrator. The number of grids must be statistically significant for the test, especially considering the fact that all tiles may not be accessible. The results are tabulated as the number of passed tiles divided by the number of tiles tested. The "statistically significant" number of tiles is addressed in TIA/EIA TSB-88. We expect something of the order of 500 tiles per test zone as a typical number.

5. Number of Samples per Tile. In the coverage test a vehicle enters the tile at a random location with a random velocity. Typically the Systems Integrator will immediately commence the automated measurement sequence. The receiver will collect and record several hundred samples as the vehicle moves through 40 wavelengths. The HSMM functional, performance procurement specification requires the median value be calculated and then used as the pass/fail criteria (for analog field strength). A similar test sequence is done for digital performance, except that the BER is measured instead of field strength. In both cases, the final value for the tile is taken from several hundred individual measurements over 40 wavelengths.

6. Size of the Tiles. Given the size of the test zones and the requirement for statistically significant number of tiles, we expect the tile size to be about 0.5 x 0.5 miles. HSMM will include a requirement in the functional specifications that the Systems Integrator is required to provide the actual grid and tile locations prior to approval of the detailed coverage test procedure. This usually occurs shortly before the test is actually conducted.

7. Voice Quality. HSMM will include a requirement in the functional specifications that the Systems Integrator provide a field strength of at least 0.5 microvolts at the receiver input port for analog radio performance. Our experience has shown that if the Systems Integrator achieve this signal strength, the owners will observe a minimum "delivered audio quality" (DAQ) of 3.0. For digital operation, TIA/EIA TSB-88 requires a DAQ of 3.4 for public safety communications and a DAQ of 3.0 for all others. These requirements will be incorporated into the HSMM functional, performance procurement specifications for the Commonwealth's system.

G2.101 Phase 1 Review (Pre-Cutover Commonwealth System Review)

This task closely examines the Phase 1 system and equipment operation by exercising the system with a limited number of users simulating actual operational conditions, and applying the results of this pre-cutover testing to both the first phase and the design of succeeding phases. Phase 1 Review (Pre-Cutover Commonwealth System Review) consists of a 90-day Phase 1 Pre-Cutover Operational Evaluation, after which the Commonwealth may, at its option, commission either additional evaluation, or redesign of the system. During this period we would perform a number of tests on the system, participating agency personnel that are testing /exercising the system would provide operational feedback, and we would have regularly scheduled meetings and teleconferences with the Commonwealth to discuss the results of testing, system status, problems and other issues. The build-out of the remaining phases of the system shall be contingent on the successful implementation of the Commonwealth System Review.

G2.102 Alarm System Design and Integration

The LMR system will include an alarm and diagnostic system as part of HSMM's functional, performance procurement specification and design. The Microwave system will also have an alarm and diagnostic system that will augment and probably update the existing system. It is convenient and operationally useful to integrate the two alarm systems, and also include site alarms. All facilities, towers, and radio sites are expected to have remote alarms to notify the network operator of intrusion alarms and network operators of system and equipment malfunctions. HSMM will include the integration of the alarm systems in the functional, performance procurement specification.

G2.103 Communications Center Upgrades

HSMM will incorporate new communications console equipment into the specifications, for each VSP headquarters location. The system will include means for independent dispatching to and from all agencies and localities that are supported by the system. Dispatch consoles will be capable of intercommunicating, including consoles from different agencies. The console equipment can reasonably be adapted for each of the other agencies as well. In addition, HSMM will provide functional facilities design for each VSP Headquarters communications center as part of Task E. This will include expansion of each VSP communications center to accommodate eight dispatcher/call taker positions.

Consoles for participating agencies will be provided only to the level commensurate with their current console complement.

G2.104 Facilities Contract Negotiation Assistance

HSMM will assist the Commonwealth in evaluation of the towers and site development aspect of the Systems Integrator Offerors' proposals, and negotiation of contracts with the Systems Integrator Offerors. We include in this scope of work a total of 200 staff-hours at the Senior Engineer level and travel/lodging for 3 round trips. We believe this level of assistance will be adequate to cover 2-3 facilities negotiation sessions.

G2.105 Procurement of the System Upgrade

During the Systems Integrator Offeror proposal preparation period, HSMM will respond to technical questions through the Contracting Officer. We will attend a pre-proposal conference in Richmond chaired by the Commonwealth. The Commonwealth will, with our assistance, escort Systems Integrator Offerors to sites for inspections, and respond to non-technical questions. HSMM will prepare and provide to the Commonwealth, within 5-7 working days, appropriate functional specification addenda and formal responses to issues raised during the Systems Integrator Offeror proposal preparation period.

HSMM will assist the Commonwealth in conducting a detailed technical evaluation of each qualified Systems Integrator Offeror proposal. We envision there will be a maximum of two proposals to be evaluated in detail. Should additional proposals be received, a screening process agreed upon beforehand will be used to eliminate the least viable proposals, to the extent that a maximum of two remain.

The technical evaluation will be a determination of compliance to the functional specification. We envision a multiple step process consistent with Commonwealth procurement regulations as follows:

1. HSMM communications engineers will carefully conduct a detailed technical evaluation of each selected proposal. Technical exceptions will be identified, and items that require clarification will be noted. A list of clarification questions will be established for each Systems Integrator Offeror and provided to the Commonwealth. These will be consolidated with clarification questions developed by the Commonwealth reviewers.

2. The list of clarification questions will be provided to each Systems Integrator Offeror in hard copy form as well as in electronic format by the Contracting Officer. The Systems Integrator Offeror will be required to respond to these questions within a specific time frame. This may require meetings with the Systems Integrator Offeror to identify issues and to review options.

3. HSMM will finalize a list of Systems Integrator Offerors exceptions and provide to the Commonwealth. The Commonwealth, with HSMM assistance, will also establish the degree of deviation from the baseline system and subsystem functional requirements. This process will include the numerical ranking of each exception, which establishes the impact that the exception has on the ability of the proposed configuration to provide the specified communications. It will also establish a numerical value of the impact of deviations from the baseline system and subsystem functional requirements.

The Commonwealth, with HSMM's assistance, will enter into technical negotiations with up to two Systems Integrator Offerors concurrently (Competitive Negotiation). HSMM will, at the Commonwealth's option and as an additional service, assist the Commonwealth in competitive negotiations with additional offerors (Refer to G2.109). Face-to-face technical negotiations with the Systems Integrator Offeror would be conducted in Richmond. Under this scenario, we envision four to six telephone conference call meetings and up to three two-day, face-to-face meetings in Richmond with each Systems Integrator Offeror. All concerned parties must come to the negotiation table well prepared and focused on completing the negotiations on time.

The intent of this process is to quickly resolve all major issues by concentrating on reducing the number of high impact exceptions in the proposal. The second goal is to stay focused and negotiate and resolve all remaining technical and contractual issues with the Systems Integrator Offerors within the allotted time frames of the procurement schedule. If there are a few minor issues remaining, agreement on these minor issues can be reached during the second round of technical/contractual negotiations.

It must be recognized that each Systems Integrator Offeror will probably have as its standard offering, a system configuration that is specific to its product line. This generally causes proposals to diverge somewhat from that described in the functional procurement specification and contract terms. We envision a parallel technical and contractual negotiation process that will allow for Systems Integrator Offeror divergence to the point that when negotiations are concluded, the Systems Integrator Offeror will provide the equivalent required contractual, technical and functional capability that is contained in the functional procurement specification. We also envision that, at that point in the procurement process, any divergence from the functional requirements will have been established and agreed to among the Commonwealth, HSMM and the Systems Integrator Offeror.

At this time, and as part of Task D, up to two Systems Integrator Offerors will be required to provide and install sufficient equipment at a VSP test site to allow HSMM to test their technology in a number of areas, including coverage and functionality. The results of the tests will form a part of the evaluation process. The Commonwealth may, at their option, ask HSMM to test additional offerors' technologies as an additional service (as described in D.06).

HSMM will revise the initial technical functional, performance procurement specification. The Commonwealth will revise the contractual terms & conditions as required.

A second round of technical negotiations in Richmond with a supplemental conference call will be conducted. At this stage only minor issues will be addressed. We envision that two telephone conference call meetings and up to two two-day, face-to-face meetings in Richmond with each Systems Integrator Offeror will be required. Any minor technical issues that still remain can be resolved after contract signing, during the Design Review/Change Order process of the Implementation Phase.

Systems Integrator Offerors will be required to provide a price proposal with their initial technical proposal. This proposal will include life cycle costs, payment terms, anticipated revenues for the Commonwealth, and other cost information in a specified format that will facilitate comparison and analysis.

The Systems Integrator Offerors will be required to submit pricing amendments to their initial price proposal that specifically reflect the system changes as negotiated in the first round. The Commonwealth, with HSMM assistance will review the initial price proposals along with all pricing amendments for technical accuracy, which may entail a single clarification question letter to each Systems Integrator Offeror. The Commonwealth, with HSMM assistance, will rank the Systems Integrator Offeror proposals. We envision one Systems Integrator Offeror review meeting each, resulting from the price evaluation. One telephone conference call meeting with each Systems Integrator Offeror is anticipated to review price proposal. Should the Systems Integrator Offeror provide pricing, payment terms, life cycle costs, revenue, etc. in a format that is inadequate or inappropriate for comparison or analysis, they will be requested to revise their proposal to provide an acceptable format. If the requested format is not used by the System Integrator Offerors the level of effort required to evaluate the provided pricing may result in a change of scope, and an adjustment in fees.

HSMM will prepare an evaluation report, which will provide a record of the process and results. This report will be provided to the Commonwealth, and will include recommendations to the Commonwealth for the most responsible and cost-effective Offeror. The Commonwealth will then establish a separate formal recommendation. The technical and price evaluation would include a written analysis of each proposal as measured against the HSMM criteria. The evaluation report would then provide an overall ranking of Systems Integrator Offerors proposals and suitable comments for the Commonwealth's management and elected officials.[changes reviewed by TAS]

This aspect of the project is critical, and requires careful attention to detail and documentation in order to minimize the possibility of protest by the unsuccessful Systems Integrator Offerors. It is appropriate for the Commonwealth to have a very careful plan in place prior to embarking on the evaluation task.

HSMM will assist the Commonwealth in presenting the recommendations to Commonwealth Officials. This scope assumes an appropriate and reasonable number of presentations on two consecutive days in Richmond, Virginia.

Final contract adjustments concerning pricing, hardware, software and services will be accomplished during the Design Review/Change Order process of the Implementation Phase. HSMM will support the Commonwealth in finalizing additional contractual and technical adjustments resulting from the Design Review and Change Orders with the successful Systems Integrator Offeror.

We recognize that the Commonwealth requires the ability to purchase additional equipment at competitive prices for substantial periods of time after the implementation of the system is complete. Part of the procurement requirements and documentation, as well as the negotiation for the contract; will include provisions for long term procurement of both fixed and non-fixed radio equipment.

G2.106 Consolidation of Functional Specifications for System Integrator

HSMM will assemble the functional specifications for the various aspects of the project into a common, functional Systems Integrator specification package. HSMM will include a requirement in the functional specifications that the Systems Integrator be responsible for detailed design, furnishing, implementation, and proof of performance of all systems and work required for the upgrade. This will include the following subsystems:

- The LMR subsystem (Fixed plant infrastructure and non-fixed equipment);
- The Microwave subsystem;
- The Mobile Data subsystem;
- The Intranet subsystem;
- The supporting physical facilities (sites, towers, etc.);
- The new and upgraded Control Site facilities and VSP Communications Centers.

HSMM will include in the functional specification requirements for the Systems Integrator Offeror to provide detailed proposals for the described Commonwealth Scenarios:

- COV ownership of the infrastructure, non-fixed equipment, transmitter sites, and two control facilities, COV maintenance of these equipments, sites, and facilities (SI to equip and train COV to perform the required operations and maintenance tasks); and COV operation and maintenance of the system.

- SI ownership of the transmitter sites (including towers and land), infrastructure, non-fixed equipment, and two network control facilities (the seven VSP Division Communication Centers are not included); SI maintenance of these sites, equipments, communications centers, and facilities; and SI operation of the system with COV oversight. Ownership of the sites and facilities will revert back to the Commonwealth at the conclusion of the contract.

HSMM will also include in the functional specification requirements for the Systems Integrator Offerors to provide a detailed proposal for Scenario 1, including elemental prices for each ownership, maintenance, and operational situation and Scenario 2, including elemental “per seat” prices for each ownership, maintenance, and operational situation

HSMM will establish a list of the current participating agency sites that are not used in the infrastructure with the intent of using them as revenue sources. This shall also include commercial sites currently in use and/or generating revenues. Identification of the sites will be completed via a request to the participating agencies.

HSMM will develop and maintain a database of transmitter sites on Commonwealth property including Commonwealth owned, leased, and commercially owned sites, which are outside the Shared network, and which may be used for revenue generation. General site characteristics will be included, to the extent that information is provided by the Commonwealth user agencies. No site visits are included in this subtask. The database is assumed to include up to 250 transmitter sites. In order to assist the Commonwealth in obtaining this information, HSMM will solicit this information from the participating agencies at regularly scheduled meetings.

The functional specification will support inclusion of the COGMARS, IFLOWS, CAPWIN, LOJAK, TCAP, PMARS, and SIRS information, to the extent that the Commonwealth has determined the configuration.

HSMM will develop and maintain a Schedule of Attributes (SOA) that generally describes the Commonwealth's expectation of the Systems Integrator Offeror during the procurement process.

HSMM will assist the Commonwealth in finalizing System Operational Requirements (SOR). We will meet with the Commonwealth sufficiently in advance of the required deadline for the SOR, as contained in Task N, in order to allow Commonwealth review of the contents of the SOR prior to that deadline. HSMM will issue a final SOR document to COV within ten working days after it is approved.

HSMM will develop a guideline document that will assist the COV in establishing requirements for third party use (for revenue or otherwise) of the LMR and microwave systems.

G2.107 Systems Integrator Review of Draft Functional Specifications

We have found, particularly where innovative design is a requirement, that face-to-face meetings with potential Systems Integrator Offerors (or suppliers of equipment) are desirable before issuing the procurement documents. These meetings would be one-on-one, and would take place at our Lynchburg office. By moving the meeting to a non-Richmond location, the potential Systems Integrator Offerors are more likely to be candid about their abilities and their specification needs, with the result that the specification and procurement documents will require fewer addenda and modifications.

We propose to facilitate the viewing of a copy of the draft functional specification at the meeting with each potential Systems Integrator Offeror, the purpose of which is to discuss what changes might be made to encourage state-of-the-art responses, and to encourage competition between Offerors. The Commonwealth may attend these meetings at their option. There will be no formal records of these meetings. HSMM will provide each potential Systems Integrator Offeror with access to author(s) of the Draft Functional Specification for the purpose of a question and answer session to determine any viable additions or deletions to the Functional Specifications document. We will review the results of the meetings with Commonwealth to access potential System Integrator Offerors comments. Upon determination of potential Systems Integrator Offeror comment viability, HSMM will incorporate the approved changes into the Functional Specification.

G2.108 Evaluation of Additional Proposals

HSMM will, at the Commonwealth's option assist in the detailed evaluation of additional proposals beyond the two as described in section G2.105, including evaluation of testing, ranking, additional report, and additional oral presentations by the offeror. This is for both the electronics aspects and the physical facilities aspects. This will be done on an "as authorized" basis by the Commonwealth and the pricing of this task represents a per offeror cost. The cost of one of these additional evaluations is included in the Task G2 price.

G2.109 Competitive Negotiations with Additional Offerors

HSMM will, at the Commonwealth's option assist in competitive negotiations with additional offerors beyond the two as described in section G2.105, including negotiations, teleconferences, meetings, reporting, and review of the contract. This is for both the electronic aspects and the physical facilities aspects. This will be done on an "as authorized" basis by the Commonwealth and the pricing of this task represents a per offeror cost. The cost of one of these additional negotiations is included in the Task G2 price.

G3. Implementation

The subtasks performed under G3 will be duplicated for each of the four phases, unless stated otherwise.

G3.01 Perform Coverage Testing

HSMM will include in the functional specification requirements that as each coverage area is complete, the Systems Integrator test the area to demonstrate the level of coverage. HSMM will witness the tests, and using the Systems Integrator's results, will analyze the test data. The functional specification will also include the requirement that the Systems Integrator provide raw data in digital form. Should the subsystem fail to meet the coverage requirements, the Systems Integrator will be required to upgrade the subsystem to a point that meets the requirements, and then retest the system.

HSMM will then perform an independent coverage test on random basis confirming the Systems Integrator's results. We anticipate that HSMM will test approximately 25% of the total coverage test area.

Only if the site passes both the Systems Integrator test and the HSMM test will it be deemed as having passed coverage acceptance. We will provide a test report and recommendations for approval by the Commonwealth. The test report will be supplied in six bound copies, plus one unbound copy. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

G3.101 System Upgrade

Since Phase 4 will be completed at least three years after Phase 1, and since the normal manufacture process is to improve and reissue products on a yearly basis, we are taking into consideration that the technology used in Phase 4 may be different than that used in Phase 1. Manufacturers strive for backward compatibility, so Phase 1 equipment will still work in the system. However, because of wide area compatibility requirements, any system implemented over a long period of time will generally end up operating at the level designed into the earliest phase, and not at the level designed into the later phases. This is true for both the infrastructure and the non-fixed equipment. Included in this scope of work is a Final Optimization Upgrade component in which we would provide oversight and technical guidance while the Systems Integrator brings all phases up to the latest revision in software, hardware, and operational capability, and tests the integrated system. During each Phase, and again after Final Optimization, we will review the Systems Integrator's working drawings, monitor the changes, and review the as-built documentation (Task M) not only for completeness, but also for the ability to be used for maintenance in a straightforward way.

G3.102 Design Review – LMR System

HSMM will take part in design review meetings, as described in the functional specification, to assist the Commonwealth in reviewing the Systems Integrator's LMR system design. The initial meeting would be part of the overall statewide design, and would establish and confirm the system architecture and overall design, as well as the migration plan, the fleet mapping process, and other considerations. The functional specification will include the requirement that associated with each implementation phase there would be a phase design review, which would address the specific phase design, siting, cutover, and other technical and operational considerations.

G3.103 Design Review – Microwave System

HSMM will take part in design review meetings, as described in the functional specification, to assist the Commonwealth in reviewing the Systems Integrator's microwave system design. The initial meeting would be part of the overall statewide design, and would establish and confirm the system configuration, channel routing, reliability targets, documentation requirements, and overall design, as well as the migration plan, integration with the LMR system and schedule, and other considerations. The functional specification will include the requirement that associated with each implementation phase there would be a phase design review, which would address the specific phase design, siting, path studies, cutover, and other technical and operational considerations.

G3.104 (Not Used)

G3.105 On-site Construction Monitor

HSMM will provide one or more on-site full-time Resident Project Representatives (RPR) at the location of each phased implementation. For subsequent phases, the representative would be temporarily assigned to the region in which the implementation is taking place for the duration of that phase.

Concurrent with subsystem testing, which is part of Task K, HSMM will visit each console, LMR and Microwave site both during construction and upon completion of construction, for the purpose of inspecting the work to confirm that it is done in a professional manner and in conformance to the functional specifications. We will develop a punch list for each site, and for each subsystem. A punch list is a list of deficiencies that must be corrected by the Systems Integrator. The punch list will identify deficiencies, which the Systems Integrator would be expected to rectify prior to testing or acceptance.

HSMM will review and monitor the Systems Integrator's ongoing design effort consisting of such items as the transmittals, drawings, and the like for the duration of the project. This will include monitoring of the FCC and FAA permitting process, which will be facilitated after implementation begins by the Systems Integrators. We can assist in site acquisition for new sites, with the assistance commensurate with the needs as established by the Commonwealth.

We anticipate one pre-construction conference for physical facilities for each phase. We will review design submittals, comment, and make recommendations. We will work with the Systems Integrators to verify that the submittals are complete and appropriate to the requirements of the functional specification.

We will conduct both announced and unannounced inspections of the console, radio and microwave sites to monitor construction in progress. In this manner we can identify discrepancies and problems while they are still manageable, and before they have a potential to have a serious impact on the project and schedule.

As part of the process we will issue technical memos, opinions, and reports as requested by the Commonwealth to address LMR and microwave issues as they occur. We will review Acceptance Test Plans as provided by the Systems Integrator, and make recommendations to the Systems Integrator about acceptability of the planned tests. We will work with the Systems Integrator to develop comprehensive system and subsystem test plans that demonstrate conclusively whether the system or subsystem has met the functional specifications.

The solicitation for agency fixed access locations will likely result in a substantial number of additional access sites, which will in turn result in additional monitoring requirements. Such additional requirements will be reflected in a future procurement phase, and thus a future modification to this contract.

G3.106 Payment Request Reviews

HSMM will review Systems Integrator requests for payment, establish the validity of each request, and recommend payment. We will track these requests and incorporate them in our Master Budget Model.

G3.107 Change Order Requests

HSMM will review Systems Integrator requests for change orders, assess the impact on cost, schedule, and design, and establish the validity of the request. We will make appropriate recommendations to the Commonwealth.

G3.108 (Not Used)

G3.109 Staging Tests

The VPSLMRN system is complex and substantial. HSMM will include in the functional specification requirements that the Systems Integrator stage the subsystems at an appropriate location, prior to shipment to the sites. This provides an opportunity to test the subsystem in a controlled area, and establish that it functionally operates as required. Many of the tests done at staging are repeated in the field, but the overall system concept is proven at staging in a location where factory technicians and engineering personnel are available for further investigation. Since the technology used in this system will not have generally been proven in actual operation, we consider the staging tests to be a critical part of the implementation process.

HSMM will work with the Systems Integrator to develop staging test plans. We will witness and take part in the staging tests, providing on-the-spot guidance and recommendations. We will analyze the results and provide the Commonwealth with a staging test report (30 days following each instance). We suggest that the Commonwealth send one or more representatives to the staging tests as well. Refer to Task K1.104 for additional staging testing information.

G3.110 Acceptance Tests

The functional specifications will require that a number of equipment and system tests be performed, in addition to the coverage tests described as part of Task G3. Many of these tests will be part of Task K. Some of them are contained here.

HSMM will witness site and subsystem tests, and sign off on the test sheets as they are completed. We will perform specific testing ourselves to verify that the testing was done accurately and impartially. We will monitor the 30-day burn-in test (refer to Task K 1.105), and provide a test report at the completion of that test. At the completion of the site and subsystem testing for each phase, HSMM will make appropriate recommendations to the Commonwealth for acceptance.

We will be present for cutover to verify that the cutover plan is followed carefully, and to provide guidance should the need come about to put the cutover process on hold.

Task H

H. The contractor shall design an interface that allows at the dispatch level, access for county and city public safety providers to the shared radio network. The contractor shall at least consider the overall impact on the radio network and the accessibility that can be provided to non-state government users. The network upgrade shall include an interface to facilitate other public safety providers interoperability. The contractor shall create a specification for other city and county public safety providers to obtain the necessary equipment to interface with the network.

The following items are part of Modification # 3:

The specification for the network interface equipment shall be functional in nature. Detailed design of the network interface shall be included in the responsibilities of the Systems Integrator, under the review and oversight of the contractor.

The following sub-tasks address the work requirements for the above RFP Task.

H. Network Interface

HSMM envisions two concerns that the Commonwealth is attempting to address with respect to Cities and Counties. The first concern is for the localities that will be actually using the system for public safety operations. This represents coverage and loading issues. The second concern is that all the localities in Virginia's 95 counties and 40 independent cities, plus COGMARS, and CAPWIN will each need an interface with the state agencies using the VPSLMRN. It is the second concern that is addressed here in Task H.

Each locality maintains a dispatch location for public safety. For purposes of this scope of work, we are assuming a single dispatch location for each locality (at the county and city level), COGMARS, and CAPWIN, although investigation may find that this is not the case. We expect that interface to the VPSLMRN will be via a terminal located in the dispatch location, much the same as the dispatch location has a terminal that accesses the National Crime Information Center, the DMV, the Virginia Crime Network, etc. We further expect that the interface will be one of two configurations:

- A terminal connected directly to the VPSLMRN network, which will allow high speed access to the radio system and also to the agencies' headquarters and dispatch locations,
- A terminal connected via a radio link into the system that will have somewhat more limited access.

Subsequent subtasks for Task H describe how we plan to approach this.

H.01 Design Network Interface

As part of this task, HSMM will research and develop a conceptual design for an RF network interface, which would enable local county and city public safety providers, COGMARS, and

CAPWIN access to the VPSLMRN. We anticipate that the local county and city public safety providers would interface the LMR voice network at the dispatcher level by creating a soft patch between the existing local county or city public safety radio channel and the LMR voice network. The direct terminal connection (direct access to the VPSLMRN network) will be a standard application of the terminals identified and specified as part of Task J2.

HSMM engineers will document the interface and functional requirements and data compiled from the user agency needs assessments. We will define and record interface attributes and analyze the loading/access impact on the LMR network. This process will enable us to finalize the network interface requirements and review the conceptual interface design with Commonwealth officials. Upon completion of the above tasks, we will prepare the network interface functional specification.

H.02 Specification for Network Interface

HSMM will develop a functional specification based on the operational and functional requirements of the network interface preliminary design. We will incorporate the specifications as part of the Systems Integrator specification provided under Task G. The Commonwealth will review the Systems Integrator specification, and provide HSMM with a consolidated list of changes or comments, which will be incorporated in the final specification version.

The Systems Integrator will provide a separate priced option that will allow other city and county public safety providers to obtain the necessary network interface equipment to interface with the VPSLMRN.

Task I

I. The contractor shall perform a tower structural analysis on each tower that will be used, based on the additional antennas necessary for the additional channels, to verify that it is below 85% capacity in accordance with the latest version of EIA-222. The contractor shall generate the technical procurement, FAA, and FCC documentation necessary to replace any tower that does not meet the 85% standard or to perform any upgrade that is required such as replacement of a shelter, increasing accessibility, upgrading grounding, environmental controls, auxiliary power, or security. Emergency generators shall be capable of seven days of continuous operation. Ring grounds shall surround every tower and every transmitter shelter. A halo ground shall be installed in every transmitter shelter or room and perimeter ring grounds shall be installed around every tower and shelter.

The following tasks are part of Modification #3:

The contractor shall include in the specifications for the systems integrator the requirement for detailed site design and tower structural analysis, under the review and oversight of the contractor.

The contractor shall provide generic plans, site design review and implementation oversight of the development and modifications to these facilities, the intent of which is to verify that the work is done adequately and as specified under the current contract, thus minimizing work that might be required as added cost change orders after tenants are identified. This will include meetings, site observations, witness of tests, etc. The contractor shall provide review of systems integrator tower structural modification drawings, and documentation of actual modifications based on input from Systems Integrator Professional Engineers.

The following sub-tasks address the work requirements for the above RFP Task.

Functional or generic specifications developed under this task will be assembled into the overall Systems Integrator specification developed under Task G.

This Section describes our approach for the preparation of specifications for site upgrades, tower upgrades, and other physical facilities. We intend to proceed by developing a set of "master" generic specifications for site facilities that will be tailored by the Systems Integrator for each site as the situation dictates. HSMM will then provide design reviews and construction observations.

I.01 Structural Analysis for Each Tower

HSMM will perform a structural review of the towers that are candidates to be used in the Virginia Land Mobile Radio Network (VPSLMRN). We will use as a minimum criteria established in the latest revision of TIA/EIA-222 (Structural Standards for Steel Antenna Towers and Antenna Supporting Structures) as amended by the Commonwealth. In each case, we will review specific tower requirements with the Commonwealth prior to undertaking the structural analysis.

Prior to the site visit, the Commonwealth will provide to HSMM all available as-built or record drawings and other information concerning the conditions of the existing towers including

designer, manufacturer and model number of the tower, foundation plans, and subsurface conditions at the time of construction. Where the documentation is available, it will be reviewed along with site inspection records and photographs taken during site surveys. Using a triage methodology, towers and other structures will be categorized. With written concurrence of the Virginia Project Manager, towers categorized, as "Recommended Replacement" or "Not Used In New System Design" will not receive further analysis. This information will be included in the Task C report.

HSMM will include a requirement in the specification that the remaining towers be subject to further evaluation by the Systems Integrator. This will be done on an "as authorized" basis by the Commonwealth. The evaluations will occur within a reasonable time period prior to implementation, scheduled in order to not impact the implementation of the LMR and Microwave subsystems. During this second evaluation, the towers authorized will be inspected by trained Systems Integrator personnel to determine physical condition of members, to verify existing member size and position when compared to the record drawings, and to verify location of existing antennas. Should high Electromagnetic Exposure (EME) radiation levels make it impossible to safely access the tower, the Virginia Project Manager shall be responsible for coordinating with co-located users to reduce power levels so that inspection can be accomplished.

HSMM will include a requirement in the specification that the Systems Integrator provide the following services:

- Climbing measurement and inspection of existing towers by a project engineer (typically a licensed professional engineer);
- Verification of drawings/reports of the tower if provided;
- Photo documentation of tower with proposed antennas, mounts and waveguide/cables;
- Structural analysis of tower foundations/guy anchors to support the proposed loads if drawings on their design or construction are provided;
- Analysis of grounding and lightning protection, both "as found" and as needed with proposed additions.

An ultrasonic thickness micrometer will be used to accurately measure wall thickness of pipe and tubing members.

This work is based on the following assumptions:

- Analyses will be performed in accordance with the latest revision of EIA/TIA 222;
- COV will specify parameters in addition to EIA/TIA 222 such as extra capacity, wind speed and radial ice load;
- Foundations will be evaluated.

HSMM will include a requirement in the specification that the Systems Integrator provide hard copies of a report containing photographs, schematic drawings and descriptions of:

- Existing tower condition;
- Identification of any defective members observed;
- Methodology and acceptance criteria used in the analysis;
- Capacity of the tower to support the proposed loading;
- Recommendations regarding reinforcement, grounding, etc. as appropriate;
- Calculations.

HSMM will include a requirement in the specification that the Systems Integrator document structural condition, existing antennas (and their mounts) and other loads. The inspection will be requested to document all antennas for the required computer model study. Documentation will be requested to consist of general evaluation from the initial review of documentation and visual review, plus any structural analyses done on authorized towers.

HSMM will include a requirement in the specification that the Systems Integrator visually observe the exposed portion of the tower foundation to estimate the condition of the foundation. The requirement will request and analysis of any foundation drawings available, and advise to the COV of whether they should pursue further foundation analysis.

HSMM will include a requirement in the specification that based on the conditions determined from the site evaluation, a computer stress analysis be performed by the Systems Integrator on existing towers remaining in the proposed system. Analysis will be performed in accordance with the latest revision, in effect at the time of the site visit, of TIA/EIA-222 to determine if the tower is stressed to a maximum of 85% of its capacity or does not exceed sway or twist limitations established by the Commonwealth. Loading conditions will be based on final configuration of the proposed system antennas. The analysis will be based on anticipated loading conditions of existing antennas, proposed additional antennas required for the additional channels, ice and wind. In order to maintain system integrity, it may be necessary to temporarily load the tower to 100% of its capacity.

HSMM will include a requirement in the specification that a written report be prepared by the Systems Integrator, which discusses structural conditions and tower capacities. Towers that exceed 85% of their capacity based on individual member stresses will be categorized "Tower Replacement Necessary." The specification will request the report indicate the approximate number of members that are overstressed (exceeding 85% of capacity) to aid in determining if reinforcing the existing tower is feasible.

A determination of the foundation capacity will be included.

HSMM will review the report for completeness and adherence to the specific criteria referenced, but will not be responsible for the recommendations and conclusions reached.

A teleconference will be held with the Virginia Project Manager and HSMM to discuss the findings of the report. Upon completion of the review of the report, the Virginia Project Manager will provide written documentation advising HSMM and the Systems Integrator of actions to be taken with each tower. Should the analysis show that the tower condition is an immediate concern for public safety, the Commonwealth should be prepared to act immediately to mitigate the situation.

HSMM will include a requirement in the specification that the Systems Integrator provide five copies of the report delivered to the Commonwealth, including one reproducible copy. The specification will also require the Systems Integrator to prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

I.02 Correlate Tower Data

HSMM will utilize information gathered in Task C, the existing tower documentation provided by the Commonwealth and the tower manufacturers. HSMM will correlate this information to form the basis for our recommendation for further evaluation to either retain a tower in the upgraded VPSLMRN, reinforce a tower, or reject a tower as unusable.

I.03 FCC Documentation

HSMM will prepare FCC Documentation for any new or modified site licenses at the listed locations. Coordination documentation for APCO applications will also be supplied. The Commonwealth will be responsible for fees associated with this task including license or coordination fees.

I.04 FAA Documentation

HSMM will include a requirement in the specification that the Systems Integrator prepare FAA Documentation for new or modified towers at the sites where modifications have occurred. Requirements for FAA notification of new tower construction will be included in the Systems Integrator RFP.
HSMM will track the activity and serve as liaison with the Virginia Project Manager. The Commonwealth will be responsible for FAA license filing fees.

I.05 New Site and Site Upgrade Design

HSMM will develop generic plans for key functional areas to be used as guidelines throughout the project. HSMM will include a requirement in the specification that generic plans will often need to be modified by the Systems Integrator due to site-specific conditions. Two meetings will be held with the Commonwealth with the goal of receiving approval for the following generic plans:

Generic Site Plan
Develop generic site environmental plan including grubbing, waste disposal, grading, backfill, compaction, and soil testing.

Generic Concrete Foundation and Pad Plan
Develop generic concrete foundation and pad plan. Define concrete composition and testing requirements, reinforcement, finishing, admixtures and inspections.

Generic Grounding Plan
Develop generic grounding plan including the requirement for a ring ground installation for towers and halo grounding system inside buildings and equipment rooms. (See Task I.06)

Generic Shelter Plan
Develop generic shelter plan prior to RFP to standardize shelters. Shelter construction, insulation, additional loads (HVAC and electric), bulletproof, appearance, roof type, enclosed generator, roof loading.

Generic Generator Plan
Develop generic plan for emergency generators. Fuel type (availability statewide), tank protection and placement (special environmental regulations). Determine maintenance, spare parts, and testing. We will include the requirement for seven-day generator operation.

Generic UPS Plan
Develop generic plan for UPS.

Generic Tower Plan
Develop generic plan for new towers. Define preferences for tower types according to required heights and land use.

Generic Accessibility Plan
Develop generic plan for site accessibility including access road width and construction. Determine any special requirements or deviation from generic designs for sites in populated areas or remote mountaintops.

Generic Security and Fire Protection Plan
Develop generic plan for site security. Determine fencing requirements, site lighting, security alarms, cameras, fire detection and suppression.

HSMM will include a requirement in the specification that the Systems Integrator modify the generic plans as necessary for the detailed design of required LMR sites. The requirement for site plans will include the effects of simultaneous operation of existing and new equipment during the transition from the existing to the new system. HSMM will review the designs and assist the Commonwealth with the approvals following the Pre Planning Study (35% design level) of the schematics and site footprint. A second approval will be required upon completion of the Final Design, prior to production of the Bid Documents.

HSMM will, as an addition in scope, provide such oversight to other Commonwealth sites not being used for the STARS Project that may be identified as candidates for third party leasing. (SI creation of a site for sole purpose of generating revenue).

I.06 Grounding Design

HSMM will review the Commonwealth's grounding specifications for sites, towers, buildings, and equipment rooms. We will consider Milspec grounding specifications and will revise and issue our generic grounding specification to meet the Commonwealth's requirements.

I.101 (Not Used)

I .102 Facilities Implementation Construction Administration

HSMM will provide administration of construction of site development, and construction monitoring for new or modified facilities. For Scenario 1, HSMM will attend and lead pre-construction meetings for each site prior to development and construction. We will chair monthly teleconferences with the site contractor management for the term of the site service. We will perform site visits at three critical construction points including (1) following excavation/rebar

placement/grounding ring (before concrete placement and backfill); (2) placement of shelter; and (3) electrical UPS/generator test. We will review Systems Integrator progress toward milestones and provide oversight. We will monitor resolution of non-conformances. Non-conformance will be determined by HSMM using the specifications as a baseline. If there is a disagreement between HSMM and the Systems Integrator, the Commonwealth will make the determination. In the event that a question arises regarding the accuracy of the design and specifications prepared by the Systems Integrator, the Commonwealth will make the determination.

HSMM will, as an addition in scope, provide such oversight to other Commonwealth sites that may be identified as candidates for third party leasing.

I .103 Procurement of Tower Upgrade

HSMM will assist the Commonwealth in vendor evaluations for the tower upgrades. It is assumed that this work will be accomplished with a subcontractor to the Systems Integrator that will be addressing the tower upgrade portion of the work. HSMM will also assist the Commonwealth in the technical portions of the Systems Integrator pre-proposal conference, evaluate the technical section of proposals, and provide negotiation assistance, for the tower upgrades. After review, we will meet with the Virginia Project Manager to discuss our recommendation. We will provide technical assistance to the Commonwealth during negotiations with the tower upgrade vendor.

HSMM will develop a guideline document that will assist the COV in establishing requirements for third party use (for revenue or otherwise) of the LMR and microwave towers.

I.104 Procurement of Site Upgrade

HSMM will assist the Commonwealth in vendor evaluations for the site upgrades. It is assumed that this work will be accomplished with a subcontractor to the Systems Integrator that will be addressing the site upgrade portion of the work. HSMM will also assist the Commonwealth in the technical portions of the Systems Integrator pre-proposal conference, evaluate the technical section of proposals, and provide negotiation assistance, for the site upgrades. After review, we will meet with the Virginia Project Manager to discuss our recommendation.

I .105 Implementation Oversight of Tower Upgrade

HSMM will include a requirement in the Specification that the Systems Integrator Professional Engineer provide inspections, administration of site development, and construction monitoring for tower upgrades. HSMM will also include a requirement in the Specification that the Systems Integrator Professional Engineer attend and lead pre-construction meetings for each site prior to tower modification and chair monthly teleconferences with the tower vendor management for the term of the tower service. HSMM will include a requirement in the Specification that the Systems Integrator Professional Engineer perform two site visits during tower upgrade or antenna placement. HSMM will review tower vendor progress toward milestones. We will monitor resolution of non-conformances.

I .106 Specifications for Tower Replacement or Upgrade

HSMM will review the findings of the site surveys and tower analyses with the Commonwealth's Project Manager and recommend approval for those towers that are to be replaced or upgraded.

HSMM will include a requirement in the specification that, based on the Commonwealth's notice to proceed, the Systems Integrator will produce Design Development Documents for replacing or upgrading of the agreed upon towers including structural elements, rerouting of cables, etc.

HSMM will meet with the Commonwealth to recommend approval of the design development. HSMM will include a requirement in the specification that, upon Commonwealth approval of the Design Development Documents, the Systems Integrator develop Final Design Documents for Commonwealth review. HSMM will include a requirement in the specification that the Systems Integrator submit final design documents to the Systems Integrator PE who will approve the final design. HSMM will review the design development submittal for completeness and adherence to the specific criteria referenced, but will not be responsible for the actual design performed by the Systems Integrator. HSMM will include a requirement in the specification that an SI PE sign the SI design documents and be the responsible party. HSMM will include a requirement in the specification that the SI will provide a copy of the PE approved final design documents to the COV.

HSMM will include a requirement in the specification that the Systems Integrator design provide certified soil and concrete testing by an independent laboratory.

Task J

J. The contractor shall integrate existing State Police law enforcement mobile data equipment (a maximum of 431 units) into the upgraded radio network. The same radio for voice communications shall be used for data transmissions. The law enforcement mobile data infrastructure shall be integrated into the State Police data infrastructure. The contractor will plan the removal of the wireless modems from the patrol vehicles and coordinate the implementation of the mobile data wireless transmissions using the upgraded mobile radios. The contractor shall verify that these 431 converted systems will continue to operate effectively on the LMR network. The contractor shall update the technical procurement documentation that was used by the State Police to purchase the previous 400 mobile data terminals. The contractor shall prepare technical procurement documentation to obtain and install 1000 mobile computer terminals. The contractor shall inventory, oversee the installation into the VSP patrol vehicles, and verify the testing of the additional 1000 mobile computer terminals. The contractor shall develop a separate inter/intra agency mobile/fixed data intranet using the microwave network

The following items were agreed upon during negotiations:

The contractor shall prepare technical procurement documentation to integrate existing State Police law enforcement mobile data equipment (maximum of 431 units) into the upgraded radio network.

The following is a design goal for the Intranet. Deviations shall be agreed upon between the COV project manager and HSMM.

There will be a main Intranet Server and a main Data Server that will be ultimately connected at a switched hub in Richmond (initially at the contractor's Richmond's office). The data will be related to system and equipment documentation, project status, and any administrative information that the project might require. Thus, the contractor data files to provide this information could be on the same physical server as the Intranet server. Later on with the mobile data installations, additional data will need to be accessed, e.g. HazMat, VCIN. RJ45 jacks will exist at each MW site to allow technicians to connect directly to the Intranet Server using the capacity of the microwave system. This allows a higher connection speed for downloading repair manuals and other documentation than would be possible using a wireless connection. An interface, e.g. between a laptop or PC and the MW system, will have to be provided. One port of the Richmond Intranet switched hub will be connected to the microwave system through a router.

There will be a router connection from the MW system, via a dedicated Frame Relay circuit, to the corresponding router, located at the VSP SPHQ computer room. The other side of this last router will be connected through the VSP firewall (already existing) to the VSP SPHQ LAN. The Intranet Server will be a node on this LAN. One or more ports of the Intranet switched hub will be available for connection to the state network through a firewall. This firewall already exists at SPHQ. The existing State network and the new Intranet will be accessible by radio/microwave connection from the Mobile Data Terminals. Some of the MDTs will have access to the Intranet Server. Most of the MDTs will be dedicated to only accessing driver and vehicle information, obtained from the VA Criminal Information Network (VCIN) host, which is a node on the VSP SPHQ LAN. The only people having access authorization to the Intranet Server will be the contractor, COV system administrators/technicians, and later on, other subscribers to the system. Other fixed user terminal locations throughout the Commonwealth (as opposed to Mobile Data Terminals) will also need to be connected directly to the MW system to allow high speed connections for authorized user personnel to review project documentation, drawings, schedules, maps, network operations, and site operations. There will other users in the VSP Communications Division that will require access to the Intranet Server; these users will use their existing SPHQ LAN connections to gain access. Additionally, there will be some technicians or administrators at each of the VSP Divisions that will require access. The Division users will access the Intranet Server via the existing VSP FR network. The capacity will be

dependent upon the amount of documentation, manuals, drawings, and project administration information that the project will require. Thus, it is difficult to estimate at this time. The only outside connections should be from the MW system via the Frame Relay circuit - between the MV system and the SPHQ LAN - and the VSP users who will access the Intranet via the VSP Data Network. Internet access may also be required (as a last resort) for some specialized databases. The contractor will have the ultimate responsibility for implementing a working Intranet. All documents, drawings, etc. must be converted to HTML paging, whether done statically or dynamically. The related hardware, software, and web page design (HTML) will be obtained through a procurement document prepared by the contractor. The contractor will insure the connectivity from the MW system to the Intranet Server at SPHQ.

The following items are part of Modification #3:

The 431 VSP units have been changed to 500 units. The Department of Mines, Minerals, and Energy (DMME) has 80 functional units that will be integrated into the network. The Department of Environmental Quality (DEQ) has 12 functional units that will be integrated into the network.

Mobile Data integration and the detailed design, furnishing, implementation, and proof of performance of the Intranet will be the responsibility of the Systems Integrator, under the review and oversight of the contractor. The specification will allow the Systems Integrator to propose either one or multiple radio units for voice and data, cost, configuration, operational effectiveness and coverage being the evaluation criterion.

Mobile Data requirements will be included for all 19 Participating Agencies.

The following contractor requirements for Mobile Data are deleted:

- ***Receipt testing of MCT units***
- ***Testing of 431 MCT subscriber units***
- ***MCT Terminal inventory***
- ***Testing of 1000 MCT subscriber units***

The Commonwealth will not provide a viable specification to be revised. The contractor is required to develop a functional specification including an untested CAD interface.

The contractor shall account for a VCIN interface to the Intranet, via the CAD interface, and a CAPWIN interface.

Intranet requirements will be included for all 19 Participating Agencies.

The following sub-tasks address the work requirements for the above RFP Task.

Functional specifications developed as part of Task J (both J1: Mobile Data Integration, and J2: Intranet) will be included as part of the Systems Integrator specification assembled under Task G.

J1. Mobile Data Integration

J1.01 Determine Commonwealth Information Technology Strategy

HSMM will meet with key Commonwealth stakeholders in Richmond. HSMM will determine VSP data infrastructure regarding Network and Desktop Operating Systems (Windows NT/Windows 9x/Unix/Linex/Novell). We will review existing Vehicle data equipment including

documentation for equipment, software, and protocols. Additionally, we will review the existing network host system that provides the interface between the radio system and the VSP computer network. Our review will encompass documentation for equipment, software, data streams, and protocols. Based on this review, the capabilities of existing hardware will be determined. Connections to existing data management systems will be reviewed including the database engine utilized, database scheme, and the volume of existing data needing conversion. Reviews and recommendations will be documented in a letter report, which will be provided to the Commonwealth, and discussed at a meeting in Richmond. During that meeting we will discuss the various issues, and agree upon a course of action. We will deliver 20 bound copies and one unbound copy of the report and HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

As part of the Task J effort, we anticipate investigating the current design and implementation of the VSP data backbone and equipment in detail.

After we have reached a full understanding of the current system, we will proceed to incorporate an interface for this mobile data system to the overall VAPSLMRN. The intent is to allow the VSP to continue using the existing 500 data units, DMME to continue using their 80 units, and DEQ to continue using their 12 units on the new system, if it is economically and practically feasible. The intent is also to develop a migration process that will allow these units to be converted to the new system with minimal disruption to the users and the organization.

We will further solicit MCT requirements from each participating agency, and to the extent these requirements are provided to HSMM in a timely manner, will incorporate the requirements into the functional specification.

J1.02 Design system interface for existing Mobile Data system

Upon receiving approval of a course of action, HSMM will develop a preliminary design for a system interface to allow the existing 500 VSP, 80 DMME, and 12 DEQ units to be integrated into the new LMR network. We envision that this will entail some infrastructure modifications or possibly some new equipment and updated software. The original equipment supplier will be contacted to determine the availability of "off the shelf" integration options. HSMM will also contact other manufacturers or integration vendors to determine the availability of on-board routers or "black box" converters to allow existing mobile data equipment to be used with new radio system. The Commonwealth will review our preliminary design and provide us with notice to proceed.

J1.03 Develop RFP for subscriber equipment interface for existing Mobile Data system

HSMM will develop a functional specification that will place the responsibility on the Systems Integrator to provide hardware and software for interfacing the existing 500 VSP, 80 DMME, and 12 DEQ units with the upgraded LMR network. Depending on the selected configuration, network host hardware or software may also be required as part of the functional specification.

We will specify that the mobile computer system proposed by the Systems Integrator pass a functional test prior to acceptance. We will observe the testing to be held in Virginia, document test results, and recommend a course of action.

J1.04 Plan for removal of Wireless modems from Patrol Vehicles

HSMM will include in the functional specification for the Systems Integrator, the requirement to develop a cutover plan, which includes removal of existing Wireless modems from VSP Vehicles. In preparation for each implementation phase, HSMM will include in the functional specification for the Systems Integrator to produce a detailed schedule for the change-out or modification of each division's mobile data equipment.

J1.05 Coordinate Mobile Data transmissions using upgraded subscriber equipment

In accordance with the configuration management plan developed as Task K, HSMM will include in the functional specification for the Systems Integrator to coordinate the cutover of existing units to the new upgraded data system, under the review and oversight of HSMM.

The configuration management inventory system database will be utilized to track the mobile data equipment. We anticipate that this will use barcodes, which we will require to be placed on each unit by the manufacturer or Systems Integrator. HSMM will include in the functional specification for the Systems Integrator to perform a receiving inspection of new hardware and physically inventory the units at the Systems Integrator supplied warehouse facility. The Commonwealth will perform receipt testing, limited to a power-on test of a statistically valid sample of units. HSMM will review and recommend for approval the Systems Integrator's installation procedures in accordance with manufacturer recommendations. It is our understanding that all mobile data computers will be a laptop configuration. The standard method of utilizing a laptop in a vehicle is to physically secure the computer in a docking station attached to a mounting bracket, plug in a power cord and attach the radio connection wire to an interface unit. To facilitate installation, HSMM will specify that the mounting bracket will be installed and inspected as part of the mobile radio installation. HSMM will include in the functional specification for the Systems Integrator to certify that all equipment mounted in the vehicle will not be in the air bag deployment zone in accordance with the vehicle's manufacturer's guidelines.

J1.06 Test 592 Subscriber units, verify operation

HSMM will establish acceptance test criteria for the mobile data equipment and system, review test procedures proposed by the Systems Integrator for incorporation of test criteria and work with the Systems Integrator to make test procedure modifications that will adequately test both the equipment and the system.

J1.07 (Not Used)

J1.08 Specifications for Mobile Computer Terminals

HSMM will develop functional specifications for sufficient new Mobile Computer Terminals to fulfill the requirements of the 19 Participating Agencies; to the extent these requirements are conveyed to HSMM. We will include in those specifications the requirement that the Systems Integrator develop a detailed design description for our review. In developing the functional specifications, we will investigate and establish the status of wireless open systems architecture,

transport protocols, data encryption, and best of class solutions. HSMM will meet and work with key Commonwealth stakeholders to reach consensus on the Commonwealth's hardware and functionality preferences. It is our understanding that the preference for Mobile Data Terminals is a mounted laptop computer system. HSMM will also determine and discuss with the Commonwealth if value-added functionality such as GPS/AVL system panic alarms are advisable.

The specifications will include the ability for the Systems Integrator to propose a second data-only radio separate from the voice radio, to be evaluated on a cost, configuration, and functional basis. In addition, the functional specification will specify the ability to use wider bandwidth commercial wireless data services, where they are available, in addition to the Commonwealth private network.

The specifications will further include requirements for developing an Intranet interface to the VCIN network, via the CAD interface. This will require evaluating existing VSP VCIN interfaces, and adapting such interfaces as deemed necessary.

Prior to developing the functional specification, we will analyze the Commonwealth's bandwidth requirements by performing a system loading study. Frequency search is part of Task B. Should additional VHF band (or other band) channels be required, they will be identified and pursued as part of Task B. HSMM will write a letter report for the Commonwealth's approval describing the mobile computer system's preliminary design basis. Following approval of the preliminary design basis, HSMM will develop functional specification for the new Mobile Computer Terminal. The review cycle for the MCT specifications will be part of the overall Systems Integrator specifications review process.

HSMM will develop a guideline document that will assist the COV in establishing requirements for third party use (for revenue or otherwise) of the mobile data system.

MCT network design will incorporate and interface with CAPWIN.

J1.09 Inventory Mobile Computer Terminals

In accordance with the configuration management plan established in Task K, HSMM will oversee the Systems Integrator while they coordinate the cutover of the new data units. The configuration management inventory system database will be utilized to track the mobile data equipment. It is anticipated that barcodes will be placed on each unit. HSMM will include in the functional specification for the Systems Integrator to perform a receiving inspection of new hardware and physically inventory of the units. Receipt testing will be limited to a power-on test, log-on script initiation, and one data query. HSMM will review and recommend for approval the Systems Integrator's installation procedures in accordance with manufacturer recommendations.

This procedure is based on the inventory described in the Needs Assessment (Task A). HSMM will, in Task J1.01, solicit all 19 Participating Agencies to determine their MCT needs. This will likely result in the purchase of more than 1000 units. Additional quantity requirements will be reflected in a future change order to this contract.

J1.10 Oversee Installation of Mobile Computer Terminals

As part of implementation Phase 2, HSMM will include in the functional specification for the Systems Integrator to develop a cutover plan under the review and oversight of HSMM, which includes installation of the new data terminals in Patrol Vehicles. The functional specification will also request the Systems Integrator to produce a detailed schedule for the change-out or modification of each division's mobile data equipment coordinated with the installation of the LMR voice radio equipment to minimize COV resource disruption. We will establish acceptance test criteria for the mobile data equipment and system, review test procedures proposed by the Systems Integrator for incorporation of test criteria, and work with the Systems Integrator to develop test procedure modifications that will adequately test equipment and system. HSMM will include in the functional specification that installation should be in accordance with the narrative above for installation of existing units.

This procedure is based on an inventory of 1000 MCTs. HSMM will, in Task J1.01, solicit all 19 Participating Agencies to determine their MCT needs. This will likely result in the purchase of more than 1000 units. Additional quantity requirements will be reflected in a future change order to this contract.

J1.11 Verify Testing of Mobile Computer Terminals

HSMM will include in the functional specification that following installation, the Systems Integrator should verify operation of the mobile computer terminals (MCT).

HSMM will establish acceptance test criteria for MCTs and the data infrastructure, review test procedures proposed by the Systems Integrator for incorporation of test criteria and review the work of the Systems Integrator to recommend test procedure modifications that will adequately test both the equipment and the system. HSMM will include in the functional specification that testing should be in accordance with the narrative above for testing of existing units.

This procedure is based on an inventory of 1000 MCTs. HSMM will, in Task J1.01, solicit all 19 Participating Agencies to determine their MCT needs. This will likely result in the purchase of more than 1000 units. Additional quantity requirements will be reflected in a future change order to this contract.

J1.101 Data Upgrade Procurement – 592 Units

HSMM will include procurement of the data upgrade for infrastructure and vehicles in the responsibility of the Systems Integrator. HSMM will attend a Pre-Proposal Conference, prepare addenda relating to the data upgrade, and respond to vendor questions. HSMM will assist the Commonwealth in the evaluation of the Systems Integrator's data upgrade proposal in accordance with the specified requirements and provide technical assistance relative to the data upgrade to the Commonwealth during negotiations.

J1.102-J1.103 (Not Used)

J1.104 Procurement of Mobile Computer Terminals

HSMM will include procurement of the Mobile Computer Terminals in the responsibilities of the Systems Integrator. We will attend a Pre-Proposal Conference, prepare addenda and respond to Offerors questions. We anticipate evaluation of the Systems Integrator's Mobile Computer Terminal proposal in accordance with the specified requirements and to provide technical assistance to the Commonwealth relative to the Mobile Computer Terminals during negotiations.

J2. Wide Area Data Network

J2.01 Develop separate inter/intra agency mobile/fixed data Intranet

HSMM will meet and work with key Commonwealth of Virginia stakeholders to reach consensus on a proposed data Intranet using the microwave network. We will determine the Commonwealth MIS preferences for Operating System, Web Server and browser. A conceptual drawing including demarcation points is shown in Figure J-1 for the Richmond backbone and Figure J-2 for a typical site and remote agency. In our current concept, the main Intranet Server, the Data Server and any other required servers act as nodes on an Ethernet based project network. The Intranet will be the repository for project documents, documentation, technical manuals, and other items such as digital photographs. The project network will be connected to the VSP LAN through firewalls, routers and a dedicated frame relay circuit. Mobile data computers will communicate with COV databases or with the Intranet server through a mobile data host computer and a firewall. High speed fixed connections will be available at each microwave site for connecting an Ethernet enabled laptop computer.

This connection will be through the Microwave system and will be available for connecting TCP/IP enabled equipment for monitoring and remote management. During the needs assessment it will be determined which remote agencies or offices will be connected through the Microwave system. The Microwave system will be designed with sufficient capacity to connect remote agencies.

As part of this process we will solicit fixed network access requirements from each of the 19 Participating Agencies, and to the extent that these requirements are provided to HSMM in a timely manner, will incorporate these requirements into the SI specification. We envision this to be a two-step process: (1) we will solicit locations of the Agency Access Locations from the agencies, and (2) we will distribute and solicit completion of a "paper survey" of those locations by each agency to ascertain items such as data throughput requirements and grounds availability for transmitter towers. Information obtained in this manner will be used as-is. HSMM will not be held responsible for the accuracy or completeness of the information.

In order to be successful, there will need to be detailed coordination between HSMM, the Systems Integrator, and the Commonwealth MIS Departments.

One key element of the coordination is to define demarcation points that establish where Systems Integrator responsibilities for equipment and software end and COV responsibilities begin. The major demarcation points are the router before the firewall in the State Police Headquarters (SPHQ) Computer Room and the router before the firewall at any other remote location LAN connection. The HSMM level of effort is based on the COV providing the resources needed to interface the Intranet with the existing Commonwealth owned WAN/LAN. HSMM will review

"replace or integrate" options with the Systems Integrator and with the Commonwealth and a course of action will be mutually agreed upon.

Should portions of the VSP (or other) LAN including but not limited to the Firewall, Servers, Routers, Network Operating System require upgrade or replacement to facilitate integration, the Commonwealth will expedite that upgrade consistent with the schedule agreed upon. The COV is responsible for providing and maintaining secure firewalls and virus detection to protect their networks from foreseeable events such as unauthorized access attempts and viruses. HSMM will include in the functional specifications for the Systems Integrator to have the ultimate responsibility for implementing a working Intranet, under HSMM oversight, with specific responsibility for hardware, software, databases, programming, and transport media on the Systems Integrator side of the demarcation point. We will specify that the Systems Integrator provide technical support to assist Commonwealth personnel in resolving compatibility problems that may exist due to limitations with hardware, software, databases, programming, or transport media on the COV side of the demarcation points.

The functional specification will include requirements that the Systems Integrator establish system loading parameters based on available capacity. HSMM will write a letter report for the Commonwealth's approval detailing the Intranet functional design basis. Upon receiving approval, HSMM will develop functional Intranet specifications that address hardware, software and the continuing home page service contract.

J2.101 Procurement of Intranet Hardware, Software and Services

The design and procurement of the Intranet hardware, software and services using the microwave network, will be included in the functional specification as part of the Systems Integrator's responsibilities.

We will attend the Systems Integrator Pre-Proposal Conference, prepare addenda and respond to questions. HSMM will evaluate Systems Integrator proposals for the Intranet in accordance with the specified requirements and provide technical assistance to the Commonwealth during negotiations.

HSMM will require that the Systems Integrator establish and provide security measures for the Intranet.

J2.102 Oversee Installation of the Intranet

HSMM will include in the functional specification the requirement that the Systems Integrator develop a cutover plan under our review and oversight, which includes installation of the new Intranet. The functional specification will also require the Systems Integrator to produce a detailed schedule for installation. Initially, the Intranet backbone will be specified to be installed at the Systems Integrator's local facilities with a Frame Relay link to the VSP SPHQ Computer Room. When permanent COV facilities are available, the hardware will be moved in accordance with the cutover plan. Following installation and until turned over to the Commonwealth at the end of the project, HSMM will verify proper operation of the system up to the demarcation points and provide technical assistance to the COV in resolving interface problems that are the responsibility of the COV. Specifically, design, installation, coordination and testing will be performed for:

(1) The Intranet backbone,
(2) One dedicated frame relay circuit for Intranet connection to the Richmond VSP LAN,
(3) Ethernet RJ45 data ports and/or hubs for laptop connection at each radio and microwave site

Testing of Mobile Data Computer connectivity to the Intranet will be verified under Section J1.

It is anticipated that over the course of the project, additional site equipment may become TCP/IP enabled embedded web servers. This feature would allow advanced equipment status display and remote system management through the Intranet. Some Uninterruptible Power Supplies (UPS) currently have this feature and it is our understanding that some microwave equipment is incorporating this feature. Should this be the case, the Ethernet RJ45 data port can be connected to a hub that would be connected to TCP/IP enabled equipment and have a spare port for the on-site technician. Coordination of the installation and testing will be included with the equipment procurement, installation, and testing. While the Intranet will allow alarm status to be displayed, it is to be understood that the Intranet is not considered a viable replacement for a real-time alarm generator such as is provided through the radio system. By design, radio system alarm generators utilize components that provide additional levels of software and hardware redundancy that cannot be incorporated into Intranets that utilize standard computers equipped with commercially available Browsers. Equipment alarm and system status will be available on the Intranet for information only and should not be used as the sole basis for evaluating the availability or operability of the radio system. It is anticipated that system status and alarm display on the Intranet will have a preset time delay.

HSMM will include in the functional specification that in the event a remote Commonwealth of Virginia site requires access to the Intranet and does not have connectivity to the State Police Frame Relay system, the Systems Integrator should prepare circuit requests for connections from these users to the State Police WAN (or directly to Intranet Server at the State Police Headquarters) and report the status of the implementation of these circuits. The Commonwealth will be responsible for providing the actual circuit using one of the following options as illustrated in Figure J2:

(Option 1) Microwave hops to connect towers to agency buildings.

(Option 2) Fiber optic (or other) cables run from towers to agency buildings.

(Option 3) Frame Relay (or similar) connections from remote sites to Richmond.

HSMM will also provide some specific engineering and design work as part of Task G, for Agency Access Locations known to HSMM prior to issuance of the SI specification.

HSMM will prepare a set of generic technical requirements for each of the three options for links to remote offices or agencies, for inclusion in the Systems Integrator specifications.

Task K

K. The contractor shall perform acceptance testing on all deliverables of subsequent contracts that were developed by the contractor. The contractor shall create and implement inventory control and configuration management. These processes will be taken over by the Commonwealth at the conclusion of the installation in a Division. The contractor shall implement the required channel plan and/or talk groups and program the new equipment accordingly. The contractor shall provide operator train-the-trainer training to designated personnel and a lesson plan for this training.

The contractor shall ensure that all items and services procured meet the specifications (including receiver and transmitter performance testing on a representative sample for every type of radio). The contractor shall independently test and document the resistance of every grounding network. It is the responsibility of the contractor to rectify any deficiencies through the project manager of any subsequent contract. The contractor is responsible for the technical specifications and their ultimate performance. The contractor shall provide written certification that all transmitters, transmission lines, antennas, radios, and sites comply with the FCC radio frequency exposure limits. The contractor shall review the Commonwealth's RF Radiation Compliance Plan and recommend any changes that are necessary.

The following items were agreed upon during negotiations:

Train-the-trainer training will be conducted once at the VSP Academy. Technical training will be provided by the vendors under Task G. This training shall include the following subject areas: intranet, mobile data, land mobile radio (LMR) subscriber, alarm system, microwave system, network operations, and radio dispatch consoles.

Contractor shall take responsibility of identifying interference and attempt to eliminate it from the system. The contractor is responsible for reasonable efforts in locating the interfering transmitter and assisting in negotiating possible solutions.

The installation and testing of any mobile or portable device (radio or computer) shall be performed in the VSP Division where the user (operator) is stationed.

The contractor should identify the equipment they plan to purchase specifically for this project and associated costs. Any equipment for which costs are passed onto the Commonwealth should become the property of the Commonwealth at the end of the project.

The contractor shall assist in evaluation of the responses to the solicitations for which they generated technical specification, to the extent described herein.

Contractor shall coordinate with subsequent vendors in an attempt to rectify deficiencies. The contractor shall provide the Commonwealth administrative reports and technical support in an attempt to resolve the deficiencies,

Any remedial performance of the contractor shall not result in any additional contractor's engineering or implementation management costs to the Commonwealth. If corrective action is required, due to the contractor's deficiency, the contractor will provide the cost of implementation management in accordance with the contract for items such as writing the procurement documentation, quality control, documentation, testing, and training. The Commonwealth will be responsible for any costs associated with additional equipment or reconfiguration of the system as a result of the system correction or update.

The consultant will be designing an upgrade to an existing network to provide additional capabilities, radio coverage, and network integration in accordance with this scope of work. This will require additional contracts (based exclusively on the consultant's specifications) from several vendors to implement this requirement.

The following items are part of Modification #3:

Acceptance testing will now reflect a Systems Integrator team rather than individual vendors.

The contractor shall require in the specification that the Systems Integrator coordinate with subsequent vendors in an attempt to rectify deficiencies. The contractor shall provide the Commonwealth administrative reports and technical support in an attempt to coordinate the resolution of the deficiencies,

The contractor shall require in the specification that any remedial performance of the Systems Integrator shall not result in any additional Systems Integrator's engineering or implementation management costs to the Commonwealth. If corrective action is required, due to the Systems Integrator's deficiency, errors, or omissions, the Systems Integrator will be required in the specification to provide the cost of management for items such as quality control, documentation, testing, and training, and also will be responsible for costs associated with additional equipment or reconfiguration of the system as a result of the system correction or update.

The following contractor requirements for Acceptance Testing are deleted:

- ***Testing Subscriber units***
- ***Testing Fixed Infrastructure equipment***
- ***Managing inventory control***
- ***Implementation of configuration management***
- ***Direction to SI for programming of subscriber equipment***
- ***Develop training plans***

The contractor shall assist in the cutover of seven (7) VSP Communications Centers and eight (8) non-VSP Communications Centers.

The following sub-tasks address the work requirements for the above RFP Task

K. Acceptance Testing

Acceptance testing occurs in three areas: Equipment testing, system testing, and coverage testing. Various individuals are responsible for conducting and verifying these tests. They include the Systems Integrator, equipment manufacturer, government regulatory agencies, purchasers and potential purchasers, contractors and subcontractors. The results of this testing is documented and much of the documentation is available from the manufacturer. Therefore, some of the testing may be relied upon without further verification. Some testing may be relied upon through review of the test reports. The purchaser or his representative must directly observe some testing.

Subscriber equipment is tested exhaustively in the manufacturer's facility. Subscriber unit testing falls into four main categories, Environmental Tests, Full Specification Tests, Production Line Tests, and Field Tests.

- Environmental tests are performed during development and early production of a product. These tests include extended heat and cold tests performed in environmental chambers, shaker table tests, drop tests, and other MIL Spec 810 tests. These tests are often destructive to the radio unit. During the life of the product these tests are performed periodically to ensure that the basic design criteria have not been compromised during production.

  Because of the destructive nature of these tests and the prolonged test period required they are not performed on all or even a small sample of production units. They are instead performed on a time basis. Only one or two of each product types per month are tested in this manner. Tests of this nature are not included in this scope of work.

- Full Specification tests are run on a representative sample of production units. They are not run on all units. These tests include the testing of specifications that require an elaborate test set-up or laboratory test equipment and usually take a relatively long time to set up and perform. Some of these types of tests for transmitters are Conducted and Radiated Emission Tests, Audio Response Tests, and FM Hum & Noise Tests. Some of these types of tests for receivers would be Audio Response Tests, Adjacent Channel Selectivity Tests, and Intermodulation Rejection Tests. Intermodulation Rejection Testing, for instance, requires three signal generators to perform. Tests of this nature are not included in this scope.

- Production Line tests and Field tests are similar. They consist of tests that can be easily performed in the field or on the production line and they are tests that directly affect the performance of the units in the field on an every day basis. They include the receiver sensitivity (both 20 dB Quieting and 12 dB SINAD), audio distortion, audio power output and operating frequency. Production line tests often also include spurious response, which is not considered a field test. Transmitter Field and Production Line tests include power output, audio distortion, and operating frequency. Field tests are addressed in this scope of work to the extent they are required.

Each subscriber unit is shipped with a copy of the Authenticated Factory and Test Documentation. Portable radio subscriber equipment is tested by the Systems Integrator upon receipt and again prior to issuing to the user. Mobile radio and control station subscriber equipment is tested concurrent with installation and again prior to issuing to the user.

Fixed end equipment is tested at the manufacturer's facility, and a test report can be shipped with the equipment. The fixed end equipment will be tested by the Systems Integrator after installation as an individual equipment device.

System testing occurs in phases. The initial phase is done at the factory or at a more local facility, during a staging test where all the equipment for a subsystem is assembled together and aligned to work together. Systems design problems are identified here, and rectified prior to shipment. After assembly at each site, the site is aligned and tested to verify that nothing has changed since the staging test. The final acceptance test is a system test where all sites in a subsystem are connected together using microwave or another wideband backbone.

This system test demonstrates both that the individual equipments are working properly and within specifications, and also that they all work together. HSMM will witness the staging tests. HSMM will also perform site testing and the final subsystem and system acceptance tests.

Coverage testing, which occurs in the same time frame as the system testing, is covered in Task G of this scope of work.

Test equipment will be purchased for this project to fulfill requirements contained in Tasks G and K. Schedule D shows the expected equipment to be purchased, or equivalent.

K1. Acceptance of Hardware and Software

K1.01 Perform Acceptance Testing of Subscriber Equipment

HSMM will include a requirement in the specification that the Systems Integrator will test all subscriber units upon receipt. HSMM will review the test plan prepared by the Systems Integrator and recommend approval to the Commonwealth.

K1.02 Perform Acceptance Testing of Fixed Infrastructure

HSMM will include a requirement in the functional specification that the Systems Integrator will test all fixed infrastructure equipment. HSMM will review the test plan prepared by the Systems Integrator and recommend approval to the Commonwealth.

K1.03 Create and Implement Inventory Control Process

HSMM will establish a process for inventorying new communication equipment and documents. First, HSMM will define the items to be inventoried and the procedure for entering the items into the inventory control process. HSMM will set up a database for tracking the items in the inventory using MS Office computer software. HSMM will include a requirement in the functional specification that requires the Systems Integrator to manage the inventorying of the items until system acceptance. HSMM will provide review and oversight to this process in order to confirm adherence to the process. Once the subsystem is accepted, the inventory control process will be turned over to the Commonwealth at the conclusion of the acceptance of the VAPSLMRN by each Division.

K1.04 Create and Implement Configuration Management Process

The VPSLMRN system will be a large, technically complex radio system that is going to be used by a large number of diverse agencies, each with their own operational needs. Nearly every major piece of equipment, both fixed and non-fixed, will be driven by a microprocessor or computer. Each of the devices will need to have a resident control program. The subscriber equipment further will require each mobile and portable radio to be programmed with the radio frequencies, talk groups, and other personality considerations unique to the particular user group to which it is assigned.

HSMM will create and establish a configuration management process to track the various configurations of the equipments that make up the VPSLMRN system. This will include review of the configuration files themselves, and a management model that matches the appropriate configurations to the appropriate devices. HSMM will include a requirement in the functional specification the Systems Integrator will be required to implement the configuration management process, created by HSMM, under HSMM oversight. When the project is complete, this configuration management model will be appropriate for continuing management of the system by the Commonwealth.

HSMM will review the Systems Integrator's configuration software, and will determine if it can reasonably be used in conjunction with standard applications such as Windows and Microsoft Office. Using the combination of a database management program and a spreadsheet program, we will develop the application. HSMM will test the integrated software package to find and correct deficiencies. HSMM will then prepare a document that conveys technical and operational aspects of the new integrated software package.

K1.05 Review and Turn Over Process to the Commonwealth

HSMM will review and turn over the inventory and configuration management process to the Commonwealth, with an appropriate training session, consisting of a one-day class of up to twenty-five people. The following items will be done in the preparation and presentation of the training course:

- Develop a course outline, presentation, and presentation aids for training.
- Develop the handouts and system documentation package for the students to be trained.
- Coordinate the course times, meeting place, and student numbers with Commonwealth.
- Present the course according to the schedule agreed upon with the Commonwealth.

K1.06 Program New Equipment with Appropriate Configuration(s)

HSMM will provide high-level oversight to the Commonwealth and the Systems Integrator to accomplish the process of programming the new equipment with the appropriate configurations. HSMM will coordinate with the appropriate representatives from the various agencies for development of talk group and subscriber configurations. This is done as part of Tasks A and B. HSMM will include a requirement in the functional specification that the Systems Integrator assist the Commonwealth and HSMM with a training session to introduce elements of fleet-mapping and provide guidelines on how to develop fleet-maps for their agencies.

Fleet-mapping is a complex interaction between the desires of a user agency for talk group configurations and the physical abilities of the particular radio. It relies on an understanding of the operational process of each user group, and may ultimately affect those operational processes. The initial fleet-mapping will result in the configuration provided to the users at cutover. Historically, after the system is in use for some period (one or two years), we have found that additional or changed communications needs arise. We have also found that it becomes obvious

to the user group that an integrated change in operational procedures accompanied by a change in their fleet-map will improve efficiency or service. The challenge in the initial fleet-mapping is to be able to provide a viable fleet-map that can be used for several years before this happens.

The Commonwealth will be responsible to work with user representatives to finalize the initial fleet-map down to the individual Unit ID permission level. This will involve developing a plan for programming the system talk-groups, console configurations, and subscriber configurations. HSMM will provide review and high-level oversight. HSMM will include a requirement in the functional specification that the actual programming will be done by the Systems Integrator as a part of their installation process.

HSMM will include a requirement in the functional specification that the Systems Integrator manage the implementation of the system configurations under review and oversight by HSMM. We note that over the course of this implementation, there will be user initiated modifications to the fleet-map configuration. HSMM will monitor and document these modifications, and from time to time will, upon direction by the Commonwealth, provide instructions to the Systems Integrator to reprogram the affected units.

K1.07 Implement the New Channel Plan

The channel plan is developed as part of Task B. Coverage is established as part of Task G.

In Task G, HSMM will review the coverage needed versus the coverage that can be licensed in various localities throughout Virginia. HSMM will also perform loading estimates for the channels throughout Virginia. From the calculations, HSMM will develop a channel plan that meets the needs of the Commonwealth.

In this task, HSMM will work with the Systems Integrator to incorporate the new channel plan in the system and the subscriber equipments.

K1.08 Review the Commonwealth's RF Radiation Compliance Plan; Edit as Required

HSMM will conduct a review of the Commonwealth's RF radiation compliance plan. HSMM will then prepare a report recommending the changes needed to the RF radiation compliance plan. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part. The functional specification will include all of the requirements of the Commonwealth's RF radiation compliance plan.

K1.09 Certify Compliance with FCC RF Exposure Limits

The FCC has established (via bulletin OET 65) the Maximum Permissible Exposure (MPE) for RF radiation for various conditions. Each site must be reviewed to determine if the MPE has been exceeded. This review consists of an engineering analysis to determine whether a site is compliant.

Should the engineering analysis show that the site is not compliant, steps must be taken to bring the site into compliance.

HSMM will review and investigate each site to establish compliance with the MPE requirements of the FCC. First, HSMM will research the RF radiation of the equipment provided by the manufacturers. Then, HSMM will use the RF radiation information to calculate the exposure levels at the sites.

HSMM will prepare a document that contains the certifications and the supporting calculations. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

K1.10 Test and Document Grounding Networks

HSMM will independently inspect, test and document the grounding at all LMR sites. HSMM will establish the test procedure and criteria for adequate site grounding. HSMM will submit a report that lists the measurements at the sites and make recommendations for correcting any sites that have inadequate grounding. Refer to Task G3.105 for installation inspections and punch list generation.

K1.11 Rectify Deficiencies

HSMM will establish a process for rectifying deficiencies found in the VAPSLMRN system through the Commonwealth's project manager. The deficiencies found in the system hardware and software will be documented in a punchlist. We will identify grounding deficiencies, and work with the Systems Integrator to rectify those deficiencies as part of Task G. HSMM will assign punchlist items to the Systems Integrator and keep track of the progress of the punchlist items. The punchlist items will be re-tested and documented to establish compliance.

K1.101 (Not Used)

K1.102 System and Subsystem Test Plans

HSMM will inspect and test the VAPSLMRN Communications System and Subsystem. HSMM will first develop a comprehensive acceptance test plan (ATP) that encompasses the specified system and subsystem performance. Once the ATP is established, HSMM will coordinate the Systems Integrator's personnel, test facilities, and scheduling needed to execute the ATP.

K1.103 System and Subsystem Testing

The results of each System and Subsystem inspection and test will be documented and signed off by HSMM and the Commonwealth. Any failed system and subsystem test will be placed on a punchlist. All failed items will be corrected by the Systems Integrator, re-tested, and documented. Refer to Task G3.105 for installation inspections and punch list generation.

HSMM will prepare a test report, which documents that the system passed the test in the ATP, and recommend acceptance. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

K1.104 Staging Tests

HSMM will manage the development and execution of staging tests. First, HSMM will work with the Commonwealth to develop a comprehensive staging acceptance test plan.

Then HSMM will work with the Systems Integrator to execute the staging ATP in a factory or warehouse setting. Because of Phased Implementation it is expected that there will be multiple staging events.

HSMM will develop a punchlist of the deficiencies found during staging. The punchlist item will be corrected and re-tested at staging or corrected and re-tested in the field.

HSMM will track the progress of the system once the Systems Integrator disassembles, packages, and ships the equipment to the field.

Staging Tests will be performed as part of Task G and the fee is included in Task G3.109.

K1.105 Subsystem Burn-In

The VAPSLMRN is envisioned to comprise a mixture of modified existing equipment and new equipment. During the first month after each subsystem is activated, equipment failures are anticipated. This should happen in a controlled atmosphere, where failures are tracked, and maintenance response is observed. This is called the "burn-in" phase.

HSMM will manage the implementation of the system burn-in. HSMM will work with the Commonwealth to establish the criteria the system has to meet to successfully complete burn-in.

All remaining punchlist items and deficiencies will be corrected and the system will be configured for its intended final operation before the start of the system burn-in. There should also be a sufficient number of users on the system before the start the burn-in test. HSMM will coordinate with the Systems Integrator to complete these tasks.

HSMM will monitor the progress of the system burn-in and document its performance. HSMM will verify that maintenance is performed for failed items and direct that the Systems Integrator re-start the test if the failure was defined as catastrophic.

K1.106 Cutover Plan

While the migration plan developed in Task F describes the migration process, each phase must be carefully cut over in order to reduce impact on user operations, and to expedite the conversion. This entails specific scheduling of individual vehicles and personnel, as well as the equipment. It also entails establishing a procedure for dispatch cutover, which must be integrated with the training schedule as well as the installation schedule.

HSMM will provide oversight to the Systems Integrator in the development of the system cutover plan. HSMM will first coordinate with the Commonwealth to identify representatives from the various agencies for development of the cutover plan. HSMM will include a requirement in the functional specification that the Systems Integrator write a plan for scheduling personnel and

planning dual/transitional operation for each phase. Finally, HSMM will oversee the implementation of the cutover.

K1.107 Headquarters Dispatch Cutover

HSMM will provide oversight to the Systems Integrator in the development of the cutover plan for each of the major Dispatch Centers at the Headquarters locations (Divisional and main HQ). HSMM assumes seven (7) VSP dispatch center locations and eight (8) non-VSP dispatch center locations will be implemented. HSMM will first coordinate with the Commonwealth to identify representatives from the agencies for development of the cutover plan. HSMM will include a requirement in the functional specification that the Systems Integrator write a plan for scheduling personnel and planning dual/transitional operation, and HSMM will review the plan with the agencies. Finally, HSMM will oversee the implementation of the communications center cutovers.

K1.108(Not Used)

K1.109 FCC RF Exposure Measurements

The FCC OET-65 document requires verification that RF exposure is below the maximum permissible exposure limit (MPE). This is normally done via an engineering study, which often establishes that radiation is within the MPE. In occasional situations, particularly in multi-user sites or sites where antennas are located low on towers, the calculation may show marginal compliance. In those situations, a measurement program is needed at that site.

HSMM will measure RF exposure levels to determine if the site complies with the FCC's RF exposure standards. HSMM will identify and conduct investigations at all applicable sites where calculated compliance appears marginal. HSMM will analyze the measurements to determine the amount of RF radiation at the sites.

HSMM will prepare a report that documents the radiation at the sites and make a recommendation for corrective action. HSMM will then manage and oversee the implementation of the system modifications needed to bring the site into compliance with FCC standards. If necessary, HSMM will measure the RF radiation at all places where corrections were made to document compliance. We note that in many cases this measurement for compliance after corrective action is taken is not necessary. The functional specification will include a requirement to allow the COV to turn off transmitters to allow its personnel to safely climb towers.

K2. Training

K2.01 Develop User Training Plans

HSMM will include a requirement in the functional specification that the Systems Integrator develop system use lesson plans for subscriber equipment under our review and oversight. Console, and system management equipment will require the development of additional

specialized lesson plans geared to the specific types of equipments in use by the various agencies. HSMM will include a requirement in the functional specification that the Systems Integrator develop agency and division specific interoperability training lesson plans under our review and oversight. Training will also be developed for procedures to be used during the cutover period from the old to the new system. All training and lesson plans will be developed in a 'train the trainer' format, and be approved by the Commonwealth. This plan will be developed prior to implementation of the system.

K2.02 Provide Train-the-Trainer User Training

User Training

HSMM will include a requirement in the functional specification that the Systems Integrator present the approved 'train the trainer' lesson plans to the designated agency trainers for subscriber users, dispatch and console equipment users. HSMM will monitor and attend one or more of the training sessions conducted by the Systems Integrator. This training should include interoperability and 'cutover' procedures. This training is envisioned to occur in a single course over a three-day period, in the general time frame of Phase 1 implementation. It will occur at the State Police Academy. The Commonwealth trainers will provide subsequent training to all Commonwealth, Federal, and locality users.

K2.101 Maintenance Training

The Systems Integrator will provide maintenance training for the fixed infrastructure and subscriber units to Commonwealth personnel. HSMM will provide oversight for this process. The training will be requested to be delivered initially in Richmond and at the manufacturer's facility during the out-years. The training shall include all equipment procured. HSMM will approve all lesson plans and monitor training.

K3. Quality Control

HSMM will be the Commonwealth's communications consultant for the design and successful implementation of this system.

Through carefully tailored and exacting functional specifications, we will create the requirement for the Systems Integrator to guarantee compliance and quality, we will test and monitor the system implementation and provide oversight to the Systems Integrator to identify problems and areas in which compliance has been compromised, and in the event that we find a problem or compliance compromise, we will work with the Systems Integrator to the end of having a successful completion. We take responsibility for the accuracy of our engineering specifications.

HSMM accepts responsibility for the quality and accuracy of its engineering and technical analyses, as well as the resulting technical specifications and reports. HSMM will monitor the Systems Integrator's work for compliance with the technical specifications.

In the event that the Systems Integrator meets the specifications and there is a system or equipment problem that turns out to be an error or omission in the functional specifications, HSMM will provide the services specified in this contract to correct the problem at no additional

cost to the State. The cost of any additional equipment, equipment modification, or implementation services will be borne by the State. HSMM will include in the functional specification that in the event the Systems Integrator does not meet the specifications, the cost of any equipment or activity required to meet the specifications will be the responsibility of the Systems Integrator.

We note, that the contract with the Systems Integrator will be with the Commonwealth and not with HSMM. Obviously we can enforce provisions of the contracts to the extent that the Commonwealth also does so.

K3.01 (Not Used)

Task L

L. The contractor shall provide and constantly update the project schedule and budget for the project. The budget shall include contractor, infrastructure upgrade, and equipment costs. The contractor shall submit monthly reports to the Project Manager for the Commonwealth and to the Contracting Officer documenting progress and outlining intermediate results. The contractor's Project Manager shall meet with the Commonwealth's Project Manager monthly in Richmond. The contractor shall submit at least two draft versions of a deliverable document prior to final review.

The following items are part of Modification #3:

The contractor shall meet with the User Advisory Review Committee (UARC) on a regular basis in Richmond (at least monthly, and twice a month until the RFP is released).

The contractor shall revise the Master Project Schedule to reflect schedule changes resulting from combining the individual solicitations into one Systems Integrator solicitation.

The contractor shall revise the Master Budget to reflect as a result of potential public/private ownership and operation to include approaches other than Commonwealth owned, operated and maintained. Additional meetings responding to changes in scope and current increased participation by agencies (UARC) will be included.

The contractor's shall meet with Commonwealth officials periodically on an ad-hoc basis for the purpose of assisting with budget related activities; review of the impact of Commonwealth policy decisions on the procurement, implementation, and operations of the system; and for other activities or assistance as determined necessary by the Commonwealth.

The following sub-tasks address the work requirements for the above RFP Task.

L. Project Management

The VPSLMRN project is complex, both in technical design and in implementation. The RFP is clear in its requirement that the Commonwealth desires to retain a highly qualified Communications Consulting Engineering firm who will provide all technical services necessary for the assessment, research, design, specification, procurement and implementation oversight for a statewide radio communications system for Virginia agencies. We appreciate the implicit desire in the RFP and subsequent documentation that there be a team environment during this process. Indeed, the nature of this project, both in magnitude and complexity, as well as the desire of the Commonwealth to investigate and possibly use new and different technology mandates this partnership approach in order for the project to succeed.

It will be necessary for HSMM to closely manage the project, both internally and externally. The HSMM project team is necessarily extensive, and will require careful management. The VPSLMRN project team, consisting of HSMM, the Commonwealth of Virginia, the Commonwealth agencies, and to the extent they participate, the localities and federal agencies, will require substantial coordination as well. Coordination of the VPSLMRN project team will

be a joint effort between the HSMM project manager and the Virginia Project Manager. Coordination of the HSMM team is the role of the HSMM project manager.

Each task described in this scope of work has a project management element that is inherent in that task. In Task L, we have included overall project management considerations, scheduling, budgeting, project meetings and teleconferences.

This project has an expected duration of 72 months. Many of the Project Management costs are time related, and would increase or decrease commensurate with a change in schedule.

We recognize and understand the Commonwealth's desire to be part of development of each deliverable document. It is our intention to work with the Commonwealth to make sure that each document contains the information needed and in a format useful for the Commonwealth and the project. To this end, HSMM interprets the requirement for two draft versions in the following way.

We will prepare a draft of each deliverable, and provide two copies to the Commonwealth for review. We will meet with the Commonwealth to discuss the draft findings and changes desired by the Commonwealth, and then will incorporate those changes in the final document. We have found in past projects that this draft/review/final process provides the optimum environment for review. In some key areas where the results of an investigation or a document could have a serious impact on later components, we anticipate interim work-in-progress review meetings even prior to publication of the draft.

In accordance with the documentation requirements of Task L, HSMM intends to supply the Commonwealth with multiple draft documentation that is required. We understand the Commonwealth's review process of distributing these draft documents to the applicable Commonwealth agencies and departments for their review and solicitation of comments.

Our process was developed in order to ensure accuracy in converting the Commonwealth's comments to text, and also to minimize elapsed time in the review process in order to meet the required schedule. We plan to submit Draft # 1 of each deliverable to the Commonwealth for review. We then will meet with the Commonwealth to identify and work out all concerns. The annotated Draft will constitute Draft # 2, which we will then convert to the final document. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

As an alternate, we can submit Draft # 1 of each deliverable to the Commonwealth for review. The Commonwealth will then consolidate comments from all reviewers, and return these comments to us for incorporation into Draft # 2, which we will submit to the Commonwealth in Bold/Strikeover format for review. The Commonwealth will again consolidate comments from all reviewers, and return these comments to us for incorporation into the Final Document. There will be no additional cost for this alternate, however we anticipate that the alternate process including Commonwealth review time will take four to six weeks longer than our scheduled process for each deliverable, which will extend the overall project schedule. The COV Project Manager and HSMM will agree on the review process for each deliverable.

Projects of this complexity and magnitude require close coordination between all involved. Initially the project team will be the Commonwealth/HSMM partnership. As the project progresses, the Systems Integrator will become part of the project team. HSMM has found that

during the majority of any project, weekly project management meetings are essential. These include face-to-face meetings and teleconferences. We have included a combination of these throughout the project in several areas. In L.06 we include monthly meetings in Richmond throughout the project. In L.106 we include bi-weekly project management meetings via teleconference to augment the monthly face-to-face meetings.

We anticipate that during the assessment and design phases occurring during the first 18 months, these meetings can be held twice monthly – one face to face, and one teleconference. During implementation and acceptance, we envision these to be held three to four times a month – one face-to-face, and the remainder by teleconference.

All reports will be identified in the Schedule of Values.

L.01 Development of Master Project Schedule

The HSMM project manager will develop, administer and maintain a master project schedule for each phase and for the overall statewide implementation. HSMM will define and identify project and implementation tasks, time frames, interdependencies, deliverables, critical paths, and responsibilities. Schedules will use our CA Superproject scheduling software, and will comprise multiple levels of activities. Major project tasks and/or deliverables will be the highest level (Level 1), sub-tasks will be next (Level 2), and as many additional lower levels as needed will be added in a manner to make the schedule manageable and meaningful as a tracking device. The schedules can be displayed either in a PERT chart or a Gantt chart format. HSMM will issue draft master project schedules in accordance with the RFP to Commonwealth officials for their review. The schedule included as part of this scope of work is the initial pass at such a schedule. We will work with the Commonwealth to develop changes, which will be incorporated in the master project schedule initial version.

HSMM will review and revise the master schedule to reflect the consolidation of vendors to a single Systems Integrator.

After the Systems Integrator is under contract, HSMM will review and revise the master schedule to reflect the negotiated schedule.

L.02 Update Master Project Schedule

By its very nature, a project schedule is dynamic. Not only are tasks added and deleted almost on an ad-hoc basis, dates are changed and tasks are registered as complete. The CA Superproject software and the HSMM scheduling manager will be part of the project management process. Once the master project schedule is issued, HSMM will maintain revision and updating control of all subproject schedules. HSMM will perform monthly status reviews of project schedule tasks, deliverables, sub-tasks, and sub-tasks elements. The master project schedule will be updated by HSMM and reviewed monthly with the Commonwealth before new revised schedules are issued. However, HSMM will only take responsibility for the changes made in the original soft copy by the HSMM project manager The Systems Integrator will be requested to use the current version of CA SuperProject as their scheduling software for this project.

At the beginning of the project we will prepare a schedule of values that will be used as billing milestones. This schedule of values will be a subset of the project tasks and will relate to an

applicable task to show a level of completion. The schedule of values will be revised as necessary to reflect subsequent modifications to the HSMM/Commonwealth contract.

HSMM will develop and update a project plan that will include milestone dates, as agreed between HSMM and VSP. The project schedule will then be revised to accommodate changes in the project plan. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part. We anticipate this will not occur more than six times per year.

L.03 Develop Master Budget

The HSMM project manager will also develop, administer, and maintain a Master Project Budget for each phase and for the overall statewide implementation. HSMM will define and identify project and implementation budget items and how they relate to the master project tasks, deliverables including payment terms and conditions. The master project budget will include at a minimum, all contractor, infrastructure upgrade, facilities, consultant fees, and equipment costs.

HSMM will issue a draft Master Budget in accordance with the RFP to Commonwealth officials for their review. The Commonwealth and HSMM will work together to identify a list of updates or changes, which will be incorporated in the Master Project Budget initial version. We anticipate that this project budget will be maintained using the existing version of HSMM's Project Management and Budget System. This system is an in-house developed package using Microsoft Office applications. It will be provided in digital and paper format. Use of a different Project Management and Budget System is not included in this Scope of work.

HSMM will revise the Master Budget to reflect private ownership of infrastructure, payment schedules on an access and availability basis, and revenues expected from site and system lease to third parties, as established by the negotiated contract with the Systems Integrator. Commonwealth budget related activities and Master Budget activities would change as a result of potential public/private ownership and operation to include approaches other than Commonwealth owned, operated and maintained.

L.04 Update Master Budget

HSMM will maintain revision and updating control of the Master Project Budget. HSMM will perform monthly status reviews of project schedule tasks, deliverables, sub-tasks, and sub-tasks elements and update the budget accordingly. The Master Project Budget will be updated by HSMM and reviewed monthly with the Commonwealth and the Systems Integrator before a new revised master project budget is issued. We will provide information to the Commonwealth to assist in their preparation of the annual budget for this project. HSMM will also prepare this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part. The Systems Integrator will be required to provide cost and budget information in an agreed upon Microsoft Office format.

HSMM management personnel will meet with Commonwealth officials a maximum of four times each year to assist the Commonwealth in preparation and presentation of the annual budget for this project.

L.05 Submit Monthly Reports

HSMM will provide monthly status reports to the Virginia Project Manager. These reports will present information on those aspects of the project with which HSMM and the Commonwealth were involved in the previous month, including a description of activities accomplished, problems encountered, problems solved, scheduled work, action and red flag items. Monthly reports will be issued in accordance with the reporting requirements of this contract.

L.06 Monthly Meetings

HSMM will meet monthly in Richmond with the Virginia Project Manager and the project team. HSMM will report and focus on project status items including schedule and/or budget items/issues. HSMM will document the results and minutes of each meeting and include them with the current or the next month's project report.

HSMM will also meet up to eighteen times per year in Richmond with the Virginia Project Manager and the User Advisory Review Committee (UARC). HSMM will participate in the meeting by providing project status, obtaining agency specific data, and presenting issues of concern to the user community. HSMM will document the results and minutes of each meeting. To ensure continuity, all information concerning the UARC will be provided to HSMM through the COV Project Manager.

L.07 Biweekly Internal HSMM Project Management Meetings

HSMM will conduct biweekly internal project meetings via teleconference between applicable HSMM team members to review project status. HSMM will notify and confirm the teleconference meeting dates, times, attendees, and agenda. HSMM will lead and conduct the internal teleconference call meetings as well as record meeting results and manage action items. While these meeting records will not normally be distributed to the Commonwealth, they will be available for review by the Virginia Project Manager upon reasonable application.

L.101 Management Presentations

HSMM will prepare project status documentation (including necessary schedule and budget items) for up to four Commonwealth management meetings per calendar year. HSMM will confirm and notify attendees of the presentation date, location, agenda and time of the Commonwealth meetings. HSMM will prepare the presentation. The Commonwealth will determine who will actually make the presentation. HSMM may make the presentation or the Commonwealth may make the presentation with HSMM assistance. After the meetings are concluded, HSMM will prepare and issue meeting summaries.

L.102 – L.103 (Not Used)

L.104 Initialization Meeting

HSMM will conduct an Initialization meeting for the start of the equipment inventory and radio needs assessment task (Tasks A and C). At the meeting HSMM will outline the project objectives and methodology and solicit advice of all attendees. Key Commonwealth and HSMM representatives will be introduced. The intent of the meeting is to establish close working relationships between all parties. After the initialization meeting is completed, HSMM will prepare and issue meeting minutes and summary.

L.105 Systems Integrator Review Meetings

During implementation, HSMM will conduct Systems Integrator review meetings to monitor and review installation activities and status. HSMM will organize on-site Systems Integrator meetings, at a facility provided by the Systems Integrator. HSMM assumes that approximately four meetings per installation site will be required. HSMM will conduct the on-site meetings with the Systems Integrator and record meeting results, minutes and action items.

L.106 Twice Monthly Project Coordination Meetings

HSMM will set up twice monthly project coordination meetings via the Commonwealth's teleconference bridge with the Virginia Project Manager and project team to review project status. HSMM will notify and confirm the meeting dates, times, attendees, and agenda. HSMM will lead and conduct the meetings as well as record meeting results and action items.

Task M

M. The contractor shall document the as-built design, infrastructure, network, systems, subsystems, software, firmware, and equipment. The documentation shall be delivered as each division is completed and updated as changes are made. This is to include all aspects of the LMR, microwave, and data networks. This documentation shall be generated in MS Office. Drawings of all network and system designs, towers, buildings, shelters, schematics of all electrical circuits, transmission lines, cabling, grounding networks, and wiring shall be provided in AutoDesk AutoCAD and shown as-built. The contractor shall take pictures with a digital camera to document the sites and towers as-built.

The following items were agreed upon during negotiations:

All manufacturers' documentation not available in AutoCAD or MS Office shall be submitted in PDF format. As-built documentation shall include modifications and the final configuration. Updates to documentation shall be provided quarterly as required. Documentation described in this contract shall be available on the Intranet to the maximum extent possible.

The following items were agreed upon as part of Modification #3:

The contractor shall include requirements in the Systems Integrator specification that the Systems Integrator provide documentation in a consistent format acceptable to the Commonwealth. The contractor shall provide the Systems Integrator structure, guidance, review the as-built record documentation for format, consistency, and adequacy for the purpose.

The following sub-tasks address the work requirements for the above RFP Task.

M. Documentation

In accordance with the as-built documentation requirements of Task M, HSMM will deliver complete as-built documentation packages to the Commonwealth as each phase or division is completed. In the specifications, HSMM will specify in the functional specification that the Systems Integrator provide record documentation for the as-built design, infrastructure, networks, systems and sub-systems, software, firmware and equipment. HSMM will include, in all specifications produced by HSMM, the requirement that the Systems Integrator require equipment vendors, suppliers and manufacturers of equipment, software and systems provide record (as built) documentation in AutoDesk AutoCAD, MS Office or Adobe Acrobat format. All documentation will be required to be presented with consistent format, and with clear and straightforward researching tools (indices, tables of contents, high level overview presentations, etc.).

This information must be provided in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

HSMM will provide an additional copy of our final proposal, contract, and any modifications to the Commonwealth in electronic format, “sanitized” such that it contains no proprietary

information. HSMM will prepare the "public" version of this information in a suitable format for dissemination electronically by and at the discretion of the Commonwealth in whole or in part.

Documentation after each Phase is part of schedule blocks 17400, 17700, 17900, 18100.

M.01 Document As-Built Infrastructure

HSMM will specify, collect, and organize documentation of the communications infrastructure sufficient for use as maintenance documentation. HSMM will review existing Commonwealth documentation policies. As part of the initial survey, HSMM will also review Commonwealth implementation of policies. We will develop general documentation during that survey as described in Task C. This will be done once and not updated by HSMM.

Following the surveys, HSMM will write a letter report establishing project radio system infrastructure documentation requirements. These documentation requirements will form a part of any specification or procurement document, and will be required of any vendor or service provider associated with the project.

HSMM will review the letter report with the Commonwealth, make required report modifications, and obtain the Commonwealth approval for the plan. During the course of the project, HSMM will specify the format of the documents to be provided by the Systems Integrator. HSMM will inventory documents received into a database and transmit it to the Commonwealth as each division is completed, but not more often than quarterly. Our intent is to have the Systems Integrator transform their installation documentation into as-built documentation, and be responsible for the accuracy, format, and consistency of the documentation. HSMM will generally confirm the accuracy of as-built documentation with site visits during construction and at final acceptance. We will review, oversee, and verify the proper assembly of the documentation into a cohesive usable documentation package.

M.02 Document As-Built Facilities

HSMM will perform a review and report, and monitor the Systems Integrator's documentation processes and progress for As-Built facilities using the same methodology and restrictions established in Section M.01. As-Built documentation requirements will include: civil and mechanical drawings; calculations; floor plans; grounding drawings; and equipment manuals. HSMM will inventory documents received it into a database and transmit it to the Commonwealth as each division is completed, but not more often than quarterly. The Systems Integrator will provide As-Built documentation for new or modified facilities for our review.

Documentation for existing facilities that are not modified will be provided to the extent that it is generated, as part of Task C. Our intent is to have the Systems Integrator transform their installation documentation into as-built documentation and be responsible for the accuracy, format, and consistency of the documentation. HSMM will generally confirm the accuracy of as-built documentation with site visits during construction and at final acceptance. We will review, oversee, and verify the proper assembly of the documentation into a cohesive usable documentation package.

M.03 Document As-Built Software and Firmware

HSMM will perform a review and report, and monitor the Systems Integrator's documentation processes and progress for As-Built software and firmware using the same methodology and restrictions established in Section M.01. HSMM specifications will state that Software documentation is to be provided in Microsoft Office or AutoDesk AutoCAD. If this is not possible, Acrobat format will be specified as acceptable. Source code is usually proprietary except when contracted directly from a system integrator. HSMM-produced software is proprietary. In the past, HSMM has recommended actions such as placing source code in the care of a third party to be opened only if the original vendor goes out of business or no longer supports the software. HSMM has also, on occasion, been able to negotiate non-disclosure agreements with software vendors to verify that interface protocols are, in fact, established and documented. HSMM will work with the Commonwealth and with vendors to verify the quality of software and provide the best operating and technical documentation available. HSMM will inventory documents received into a database and transmit it to the Commonwealth as each division is completed, but not more often than quarterly. The Systems Integrator will provide As-Built documentation for new or modified equipments for our review. Documentation for existing equipments that are not modified will be provided to the extent that it is generated as part of Task C. Our intent is to have the Systems Integrator transform their installation documentation into as-built documentation and be responsible for the accuracy, format, and consistency of the documentation. HSMM will generally confirm the accuracy of as-built documentation with site visits during construction and at final acceptance. We will review, oversee, and verify the proper assembly of the documentation into a cohesive usable documentation package.

M.04 Digital Photographic History

HSMM will review state documentation policies for electronic format photographic archives. HSMM will write a letter report establishing project photography requirements including: file type requirements; resolution; distribution medium; incorporating pictures taken by state personnel; etc. This scope of work is based on use of standard JPEG. Recommendations will be made in a letter report, which will be reviewed with the Commonwealth for approval.

HSMM will take pictures and transfer them to the required file format directly through a digital camera or by scanning photographs.

HSMM will collect the available documentation, inventory it into a database, prepare and transmit it in digital format to the Commonwealth as each division is completed, but not more often than quarterly.

The image management requirements for this project will be implemented through the Intranet System described in Task J2 at the discretion of the Commonwealth in whole or in part.

We also intend to record some of the history of this project using conventional photographic methods, for our own use. Should the Commonwealth desire copies of these photographs, we will provide them as a reimbursable expense item.

M.05 Project Correspondence

The VPSLMRN project is projected to have a duration of at least six years, and to involve a team of vendors headed by the Systems Integrator. The HSMM team has subcontractors, and the Commonwealth includes multiple organizations as well. We consider it to be essential to establish a formal transmittal process for document control and correspondence, to be used by all organizations that are part of the project.

Early in the project, HSMM will establish a transmittal system for project correspondence. We expect that the Commonwealth and all vendors will utilize the system established by HSMM. An overall log of project transmittals will be maintained in electronic format by each organization, with a master log maintained by HSMM. The log will be published periodically, and all participating organizations will be responsible for verification of the accuracy of the log with respect to any correspondence that they generate.

Task N

N. The network upgrade should be performed in accordance with the following schedule. A proposed schedule that delays progress from the following schedule should be justified and will factor into the scoring of the proposal.

Solicitation Schedule	*Date Completed*
Consultant Contract Anticipated Award Date	*January 1, 2000*
*Facility Upgrade Solicitation Issued **	*March 1, 2000*
*New Facility Solicitation Issued **	*April 1, 2000*
*Towers, Transmitter Sites Upgrade Solicitation Issued **	*September 1, 2000*
*Mobile Data Solicitation Issued **	*January 1, 2001*
*Radio Equipment Solicitation Issued **	*January 1, 2001*
Radio Equipment Proposals Received	*April 1, 2001*
Radio Equipment Contract Awarded	*August 1, 2001*
Division 1 Equipment Received	*December 31, 2001*

Year	*Division(s) Completed*	*Date Operational*
2	*Richmond*	*December 31, 2002*
3	*Appomattox and Chesapeake*	*December 31, 2003*
4	*Culpeper and Fairfax*	*December 31, 2004*
5	*Salem and Wytheville*	*December 31, 2005*

** Note that all Solicitations will be issued by the Commonwealth.*

The following target dates and items were agreed upon during negotiations:

Consultant Contract Anticipated Award Date	*July 1, 2000*
Facility Upgrade Design Specification Released	*September 1, 2000*
New Facility Design Specification Released	*October 1, 2000*
*Intranet Solicitation Issued**	*January 1, 2001*
Towers, Transmitter Sites Upgrade Solicitations Issued (Possibly Three Vendors)*	*May 1, 2001*
Radio Equipment Solicitation Issued (Possibly Two Vendors)*	*June 1, 2001*
Radio Equipment Proposals Received	*September 1, 2001*
*Mobile Data Solicitation Issued **	*October 1, 2001*
*Microwave Solicitation Issued**	*October 1, 2001*
Radio Equipment Contract Awarded	*January 1, 2002*
Division 1 Equipment Received	*July 1, 2002*

Year	*Division(s)*	*Completed*
2	*Richmond*	*July 1, 2003*
	System Review	*October 1, 2003*
3	*Appomattox and Chesapeake*	*October 1, 2004*
4	*Culpeper and Fairfax*	*October 1, 2005*
5	*Salem and Wytheville*	*October 1, 2006*

The following items are part of Modification #3:

Modify target dates and milestone schedule in the project plan to reflect a single procurement. The contractor will strive to maintain or advance the current implementation schedule, however the Systems Integrator timetable may drive implementation.

The contractor shall revise the detailed master schedule to reflect changes in the project plan.

During the initial planning period HSMM will prepare a detailed Master Project Schedule.

The following sub-task addresses the work requirements for the above Tasks.

Extensions to the project schedule that are caused solely by the actions of HSMM will not result in any additional fees charged by HSMM to the Commonwealth.

N.01 Network Upgrade Schedule (Master Project Schedule)

The Master Project Schedule is described in Task L.

Semi-annually, we will provide a single copy of the detailed project schedule, showing Level 1 (high level), and Levels 2 and 3 in PERT and Gantt format. A detailed schedule is an essential project management tool. In development of this schedule, we were able to identify and link all the aspects of the project as stated in the RFP, and the components critical to the project's successful completion that were not explicitly stated in the RFP.

This is a working schedule. It will form the basis, and will provide the detail needed to coordinate and track the various project components and the various organizations that must work together for the duration of the project. This includes the Commonwealth of Virginia agencies, the Systems Integrator, and the members of the HSMM team.

As part of Task L, HSMM will review and revise the master schedule to reflect the consolidation of vendors to a single Systems Integrator, along with associated modifications of tasks as contained in the project plan.

Task O

O. The milestones for the project shall include at a minimum:

1. Radio needs assessment approved.
2. Channel plan approved.
3. Infrastructure resources evaluation approved.
4. Existing facility (backup control center) upgrade solicitation issued.
5. Control center facility solicitation issued.
6. LMR and microwave technology capabilities report approved.
7. Commonwealth responds with upgrade features and requirements.
8. Migration plan approved.
9. Network radio coverage report approved.
10. Radio equipment upgrade procurement documentation approved.
11. Radio tower structural analysis completed
12. The Commonwealth issues tower and site upgrade solicitation.
13. Radio network interface specification approved.
14. Data intranet design approved.
15. Commonwealth issues the LMR and microwave upgrade solicitation.
16. Commonwealth issues the mobile data solicitation.
17. Radio coverage acceptance test plan approved.
18 Division 1 towers and transmitter sites upgraded.
19. Division 1 LMR and microwave networks upgraded.
20. Contractor moved Division 1 MCTs to the mobile radios.
21. Division 1 LMR coverage verification reports approved.
22. Network operation transferred to the new facility.
23. Divisions 3 & 5 towers and transmitter sites upgraded.
24. Divisions 3 & 5 LMR and microwave networks upgraded.
25. Contractor moved Divisions 3 & 5 MCTs to the mobile radios.
26. Divisions 3 & 5 LMR coverage verification reports approved.
27. Divisions 2 & 7 towers and transmitter sites upgraded.
28. Divisions 2 & 7 LMR and microwave networks upgraded.
29. Contractor moved Divisions 2 & 7 MCTs to the mobile radios.
30. Divisions 2 & 7 LMR coverage verification reports approved.
31. Divisions 4 & 6 towers and transmitter sites upgraded.
32. Divisions 4 & 6 LMR and microwave networks upgraded.
33. Contractor moved Divisions 4 & 6 MCTs to the mobile radios.
34. Divisions 4 & 6 LMR coverage verification reports approved.
35. 1000 additional MCTs fully integrated and operational.
36. RF Safety is certified and plan reviewed and modified.
37. As-built documentation approved.
38. Configuration management and inventory control transferred to Commonwealth

The following sub-task addresses the work requirements for the above RFP Task.

O.01 Project Milestones

HSMM has developed a comprehensive implementation plan, which takes into consideration all of the project milestones listed in this scope of services.

Task P

P. The contractor should interview the Federal Law Enforcement Wireless Users Group, FLEWUG, and for the purpose of creating shared network operations that would allow them to communicate separately on the Commonwealth's infrastructure. The FLEWUG will provide a single point of contact for the contractor to work with. The contractor shall determine what impact including these new users on the system will have and identify what resources are needed to support these additional users. Approval shall be obtained from the Commonwealth before the FLEWUG users are added to the system design. The Contractor shall prepare the technical and administrative portions of a contract between the Commonwealth and the FLEWUG.

The following sub-tasks address the work requirements for the above RFP Task.

P.01 Interview FLEWUG Agencies

HSMM will interview the federal systems representative at a site in Northern Virginia, to obtain a listing of the inventory of equipment used by the FLEWUG agencies operating on the Commonwealth radio system and to identify growth predictions and existing 'unfulfilled demand' for these agencies. The interviews will also be used to clearly identify all interoperability requirements between FLEWUG and state agencies, and all statewide 'roaming' requirements of the federal users. FLEWUG will provide a single point of contact, who will be empowered to act for all FLEWUG agencies for the purpose of fulfilling this task. We anticipate this will be accomplished in a single work week.

The inventory listing will be confirmed by providing our tabulation to the FLEWUG point of contact for their verification.

P.02 Create Shared Network Operations

HSMM will prepare a report and study to the Commonwealth outlining the impact/benefits of allowing FLEWUG users on the statewide LMR. This will involve a single presentation to the Commonwealth.

HSMM will include all FLEWUG interoperability requirements in the development and design of the statewide radio system. HSMM will establish and maintain a procedure to track the inventory of FLEWUG equipment used on the state system for the duration of the project. FLEWUG users will be accounted for and included in the assignment of system ID's throughout the process. During the interview processes the interoperability procedures will be defined and any new requirements developed. HSMM will also develop interoperability procedures for use during the system's migration periods. These requirements will be organized into a lesson plan for training for FLEWUG users and the state agencies requiring interoperability with FLEWUG users. FLEWUG users will be included in all system training plans. HSMM will include all FLEWUG users and requirements in the various divisional migration plans during the implementation of the system.

Task Q

Q. The contractor's project management staff shall have temporary/permanent offices in the Richmond area.

The following sub-tasks address the work requirements for the above RFP Task.

Q Richmond Field Office Facility

We recognize the need for an office local to the project and the Richmond area. While the offices involved in this project are located quite close to Richmond, an immediate location will be necessary for day-to-day coordination with the Virginia Project Manager, and as a base for the meetings needed for the project. We therefore plan to establish an office facility on the western side of Richmond convenient to the VSP offices. This office could be located in the City of Richmond, Henrico County, or Chesterfield County.

We note that the locations of the HSMM offices throughout Virginia and in North Carolina provide personnel and offices within a two-hour drive of nearly 100% of the Commonwealth. This means that the critical design and research effort can be done in existing HSMM offices convenient to the established HSMM support resources such as our extensive computer network, senior HSMM personnel, a variety of technical specialties for immediate consultation, the HSMM library network, and the records and technical support information gathered from our extensive history of communications work. This also means that essential local project management functions will be performed by personnel located near the Virginia Project Manager.

This project has an expected duration of 72 months. Many of the Richmond office facility costs are time related, and would increase or decrease commensurate with a change in schedule.

Q.01 – Q.04 Establish Richmond Field Office Facility

HSMM will locate a field office in the Richmond area. We will work through a local realtor to find an office space that is located convenient to the VSP offices and access to major north/south and east/west highways. The requirements will include a reception area, offices and workstations, a meeting room, restroom(s), and adequate parking. The location should be convenient to motels and restaurants.

The facility will be equipped with telephones, copier, and fax. The computer system will be equipped with a WAN server and interfaced to the HSMM network to facilitate interoffice document exchange and email.

The office will be the headquarters of the assigned field manager and used by other project personnel as required, and will be staffed with a full-time clerk/receptionist. The office will be maintained throughout the project duration.

The office will include a dedicated four-wheel drive vehicle, which will be used for the VPSLMRN project.

Task R

R. The contractor shall inform the Commonwealth of all relationships with firms involved in the types of products and services identified within. To protect the interests of the Commonwealth, the contractor shall inform the Commonwealth in writing of all assistance and information received, solicited and unsolicited, from such vendors during the contract period and shall provide to the Commonwealth a copy of all information communicated nonverbally during the contract period. The Contractor shall advise the Commonwealth of any areas of the technical documentation provided that may have been influenced by a particular vendor, and identify the vendor.

The following sub-tasks address the work requirements for the above RFP Task.

R. Vendor Contact Considerations

We understand the need for the Commonwealth to maintain control and documentation of vendor contacts, and to understand the information that has been obtained from the vendors. We plan to establish a process that provides that information to the Commonwealth to the extent that it applies to this project.

As a qualified Architectural – Engineering - Communications Engineering firm we currently participate in a number of projects for a variety of clients, nearly all of which require close contact with most of the vendors and contractors that might be involved with the VPSLMRN project. We also regularly attend trade shows and vendor seminars, and research vendor capabilities as a routine matter to maintain our technical expertise and to be informed of the business environment in which we operate. While we normally document all contacts with vendors for our own records, only the documentation with respect to contacts pertaining to or affecting this project will be provided to the Commonwealth.

Independence from all manufacturers, vendors, and dealers of equipment or service who are prospective responders to invitations to bid, propose or present qualifications is a long-standing policy of HSMM and is critical to our position as a leading Architectural – Engineering Consulting firm. We successfully maintain the position of independent designer, specifier, and negotiator while remaining informed of the capabilities and qualifications of companies in the marketplace and independent of them.

R.01 Vendor Contact Reports

HSMM will establish a vendor contact reporting system to inform the Commonwealth of vendor assistance and information received, written or verbal, solicited or unsolicited during the contract period, when such a contact is specific to this project.

R.02 Vendor Documentation Provision

HSMM will issue vendor contact reports to the Commonwealth and with copies of vendor documentation received, for every month in which reportable vendor contact with respect to this project has occurred.

BASIS OF SCHEDULE OF HSMM FEES

The scope of work and the extent of HSMM's and the Commonwealth of Virginia's responsibility are based on the following:

VIRGINIA RESPONSIBILITY AND TASKS:

1. The Commonwealth will appoint a project manager who will be the single point of contact for this project. This individual will coordinate all activities for the Commonwealth, state Agencies, state Law Enforcement, and the non-state entities.

2. The Commonwealth will provide review and approval of submittals and draft reports according to the project schedule, and respond with consolidated comments.

3. The Commonwealth, with the assistance of HSMM as provided in the attached scope of work, will conduct all procurement activities for this project. The Commonwealth will provide information copies of the terms and conditions and all specification boilerplate for the procurement to HSMM so that HSMM is aware of this information and can provide for uniformity and consistency between the technical specifications and general terms and conditions.

4. Geotechnical, subsurface, materials testing fees and the costs of boundary and topographic surveys are the responsibility of the Commonwealth.

5. Filing fees (FCC, FAA) costs of permits, and costs of licenses are the responsibility of the Commonwealth.

6. The Commonwealth will provide access to sites, a guide, will open gates, remove covers, and will provide ladders and safety equipment that is site specific as required by the Commonwealth, except for that required by tower climbers.

7. For any change made to sites, towers, or equipment subsequent to site visits provided under Task C, the Commonwealth must inform HSMM of the nature and details of those changes in an appropriate format.

8. The anticipated duration of this project is six-years and is used as the basis of this proposal and for the planning for the project.

9. Project milestones will be agreed upon between HSMM and VSP and contained in the Project Plan.

HSMM SCOPE:

1. Consideration for other jurisdictions and joint-use shared systems will be for entities operating generally within the boundaries of the State of Virginia.

2. Except as specifically stated, this scope does not include any effort associated with rezoning property, providing conditional use permits, and obtaining approval of governmental agencies. Additional fees may be required for bidder/offeror and contractor litigation and protests.

3. Computerized Propagation studies will be done as part of the effort for Task G, although the files obtained will be used as part of Task B. We will provide a coverage report with our findings. HSMM may, at our option, include a larger number of sites in the selection process. Additional propagation studies requested by and at the option of the Commonwealth may be negotiated as an increase in scope.

4. The objective of the project is the implementation of the LMR System as defined in the Scope of Work. Immediate fixes to the existing system and operations are not included in this scope of work.

5. Except for the Prime Site design and other activities that comprise Task E, and the tower structural analysis required under Task I for towers, a detailed structural analysis of buildings, towers, and other facilities is not required. Subsurface investigation is outside the scope.

6. Specifications developed by HSMM will be provided to the Commonwealth in hard copy form and as digital files for the use of this specific project only. Specifications are not to be provided to other localities or states for their use in procurement of similar systems.

7. The specification will include wording that will require that if a vendor notifies the Commonwealth that all or part of the system or facilities is complete and ready for inspection or test, and should that prove not to be the case when tested or inspected, the vendor will reimburse the Commonwealth for HSMM charges associated with retest, re-inspection, and resolution of the problem.

8. This scope is based on sufficient review and information gathering meetings in Richmond and on site as described herein to obtain the necessary information and make the necessary decisions pertaining to the project. Additional meetings, at the option of the Commonwealth, are considered an increase in scope.

9. Assistance in licensing is exclusive of license fees and coordination costs, which will be billed as an additional expense. Attorney fees, effort and costs associated with license modifications, effort involved in defending against unexpected interference to or from existing licensees, effort in obtaining special temporary authority (STA), or any effort beyond that coordination effort described herein may, at the state's option, be authorized as work that is outside the scope.

   While HSMM can generally provide some guidance on the availability of radio channels, pursuit of these channels by means other than that of a standard application to the FCC through the normal coordination channels is outside the scope of this project and may require sub-contracting to a legal firm that specializes in such activities.

10. Digital communications and the Use of Magnetic Media.

    HSMM currently uses the following computer software:

    Microsoft Word 2000
    Microsoft Excel 2000
    Microsoft Access 2000
    CA SuperProject, version 4.0b
    AutoCAD, release 14
    Adobe Acrobat 5.0

The software is updated, from time to time, to the current version after coordination with the Commonwealth.

We can provide documentation produced by our computer systems on magnetic media or CD-ROMs in formats of other computer systems. Such files will be provided as export files into the formats of the other computer systems. The controlling documentation will be a hard copy. We are not responsible for the effects of exporting files to the formats of the other computer systems. This conversion process might result in format, reference or calculation errors.

HSMM has the ability to send and receive E-mail messages. For purposes of security, we prefer to provide and receive sensitive or critical information either by facsimile, mail, or direct modem connection. E-mail will be checked on a periodic basis, at least once a day.

Any information sent by E-mail with critical timing requirements should include also a facsimile to the appropriate recipient alerting them that there is an E-mail message waiting.

11. The fee schedule assumes that the user agencies include19 state agencies and they are considered to be primary users. Federal agencies and are considered to be secondary users. There will be a single point of contact for all federal agencies.

12. Abbreviated Needs Assessment for inclusion of City or County in COV system. Provides for determination of Public Safety two-way radio communications needs of the locality. This includes:

- Quantity of radios by type and department
- Number of talk-groups
- Current and projected radio traffic volume
- Service area
- Dispatch requirements (assumes worst case of wire line or microwave access to VPSLMRN)
- Summary letter report of needs assessment findings

This needs assessment assumes that the VPSLMRN will provide service to the locality without modification of location of tower sites and within the context of the overall VPSLMRN design. Capacity of the VAPSLMRN in the service area of the locality will be adjusted to accommodate the public safety two-way radio communications needs of the locality. Other design parameters will not change.

Fee schedule does not include:

- Travel and per diem expenses.
- Formal presentation to the locality
- Complete VPSLMRN needs assessment report

13. Invoicing/Payment Expectations

Early in the project, HSMM will establish a Schedule of Values in conjunction with the project Schedule and detailed task descriptions. This schedule of Values would consist of major project Milestones. We would expect to add such items as deliverables, reports, specifications, analyses,

solicitations, and intermediate points of a percentage of completion. This schedule of values would be created such that they would be used as reasonable project reporting points.

The Schedule of Values would also have a monetary value based on the total consultant fee for a task and the staff effort required to complete the item. Thus, the schedule of values would be a more detailed breakdown of the quoted fee for a task and would be the basis of invoice preparation.

See section two, General Terms and Conditions, paragraph H.1.e.

14. An Evaluation and Negotiation Account of $110,719 is part of the Task G fees (G2.108 & G2.109), and is based on detailed evaluation of one additional Systems Integrator Proposals, and competitive negotiation with one additional short listed Systems Integrator Offerors.

15. Effort that is related to subscriber unit count is predicated on the quantities contained in schedule A, +/- 4 percent.

16. The effort described herein assumes the existing 87 VSP sites plus a maximum of 14 new sites.

17. A Technology Testing Account of $42,373 is part of the Task D fees (D.06), and is based on the testing of one additional Systems Integrator Technology.

THE COMMONWEALTH AND HSMM AGREE THAT THIS SCOPE OF SERVICES DOES NOT INCLUDE ANY REQUIREMENTS FOR:

1. Consideration for other jurisdictions and joint-use shared systems and interoperability other than those specified herein

2. Detailed documentation of the existing system, except as provided for as part of Task C. Evaluation of, and recommendations for, existing system maintenance is not required.

3. Short-term recommendations for modification and improvements to the existing system and operations. Short-term plans and budgets are not required.

4. Planning and designs for 9-1-1, GIS, AVL, and EOC facilities and systems.

5. Analysis of the effect of towers on local AM broadcast stations, if any.

SCHEDULE A, SUBSCRIBER UNIT COUNT

Virginia Public Safety Land Mobile Radio Network

June 26, 2000

Divisions	State Police	Corrections	Conservation & Recreation	Game and Inland Fisheries	Alcoholic Beverage Control	Transportation	Emergency Services	Forestry	Marine Resources	Motor Vehicles	Health	Mines, Minerals and Energy	Capitol Police	Totals	Total Mobile & Portable Units	Number of Channels Required
Mobile Radios																
Richmond	534	298	44	70	42	1176	50	30		40	10		10	2304	3283	27
Culpeper	210	117	17	28	17	462		120						971	1388	12
Appomattox	191	106	16	25	15	420		60						833	1171	10
Wytheville	210	117	17	28	17	462		150				135		1136	1582	14
Chesapeake	324	181	27	43	26	714		60	268					1643	2299	20
Salem	229	128	19	30	18	504		150						1078	1548	13
Fairfax	210	117	17	28	17	462		30						881	1223	10
Total, Mobiles	1908	1064	157	252	152	4200	50	600	268	40	10	135	10	8846	12494	106
Portable Radios																
Richmond	534		47	56	28	140	50	25			10		89	979		
Culpeper	210		19	22	11	55		100						417		
Appomattox	191		17	20	10	50		50						338		
Wytheville	210		19	22	11	55		125				4		446		
Chesapeake	324		29	34	17	85		50	117					656		
Salem	229		20	24	12	60		125						470		
Fairfax	210		19	22	11	55		25						342		
Total, Portables	1908	0	170	200	100	500	50	500	117	0	10	4	89	3648		
Total, MCTs	1431													1431		
Total, Grand	5247	1064	327	452	252	4700	100	1100	385	40	20	139	99	13925		

Information taken from the Implementation Plan for a Statewide Shared Land Mobile Radio System, November 9, 1998, page 55.
VSP portable radios and Capitol Police mobiles not included in the in the number of radio channels calculation.

Schedule of Fees

Task	Fee
A. Perform radio asset inventory, needs assessment, and project expected growth.	$295,266
B. Document existing radio frequency authorizations. Devise a frequency reuse strategy. Determine the capacity of the channels. Obtain additional channels if required. Ensure non-interference. Develop a channel plan.	$474,143
C. Evaluate and document the State Police combined radio infrastructure.	$744,849
D. Perform microwave and LMR technologies assessment.	$564,943
E. Design and document the facility upgrade for the network. Design and document the new facility for the network. Transfer operations to the new facility.	$20,684
F. Prepare a migration plan.	$302,523
G. Design an upgrade to the existing VSP LMR and microwave networks. Document the designed coverage of the network. Add any new LMR or microwave sites that are required. Create the required technical procurement documentation. Perform coverage testing on the completed network.	$5,915,223
H. Design a network interface. Create a network interface specification.	$61,752
I. Perform a tower structure analysis. Generate the tower technical procurement, FAA and FCC documentation.	$4,657,062
J. Integrate existing mobile data equipment into the upgraded radio network. Integrate mobile data infrastructure into the State Police data infrastructure. Plan for the removal of the wireless modems from the patrol vehicles. Coordinate the mobile data transmissions using the upgraded radios. Verify converted systems effective operation. Update the technical mobile data procurement documentation. Prepare documentation to obtain and install 1000 MCTs. Inventory, oversee the MCT installation into the VSP patrol vehicles. Verify the testing of the additional 1000 mobile computer terminals. Develop an inter/intra agency data intranet using the microwave network.	$898,929
K. Perform acceptance testing on all deliverables. Create and implement inventory control and configuration management. Program the new equipment with the channel plan and/or talk groups. Implement the new channel plan. Provide operator train-the-trainer training. Ensure RF safety compliance. Edit the RF radiation Compliance Plan.	$2,653,482
L. Maintain the project schedule and budget. Submit monthly reports and attend monthly meetings.	$2,123,741

M. Document the as-built design, infrastructure, network, systems, subsystems, software, firmware, and equipment.	$404,390
Q. Provide temporary/permanent offices in the Richmond area.	$833,209
R. Vendor/Commonwealth Interface	$117,165
GRAND TOTAL FOR ALL WORK	$20,067,361
K. Project Specific Insurance	$295,000
P. Costs to interview FLEWUG, and create shared network operations, if proposed.	$109,207
Modification # 2 fees: Conceptual work plan, modification of contract test and contract costing.	$58,551
Modification #3 fees: (Below lists the addition or subtractions of fees by task.)	
Task A	$0.00
Task B	$0.00
Task C	$3,743.00
Task D	-$81,511.00
Task E	$636,739.00
Task F	$46,017.00
Task G	$296,255.00
Task H	$7,334.00
Task I	-$1,291,127.00
Task J	-$123,546.00
Task K	-$640,871.00
Task L	$656,236.00
Task M	$0.00
Task N	$0.00
Task O	$0.00
Task P	$0.00
Task Q	$0.00
Task R	$0.00

Revised Contract Grand Total: **$20,039,388**
(2.1111% decrease)

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 26, 2000

Additional Services

Task	Description	Fee (at 2000 rate)
A.02	Abbreviated Needs Assessment for inclusion of City or County in COV system.	$24,500
G1.101	Additional Microwave Path Survey beyond 24	$3,230
I.01	Tower inspection and analysis, each tower.	
	Guyed Towers	
	50' to 200' high	$6,500
	200' to 300' high	$6,875
	300' to 400' high	$7,500
	400' to 500' high	$7,875
	Self Supporting Towers	
	50' to 200' high	$6,250
	200' to 250' high	$6,875
	Above 250' high	$7,500
	Monopole Towers	
	All heights	$4,125

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 29, 2000

HSMM SCHEDULE OF RATES

Project Manager	
Communications	$123.54
Architecture/Engineering	$115.28
Senior Level	
Communications Engineer	$112.26
Architect	$82.07
Engineer	$88.00
Staff Level	
Communications Engineer	$84.21
Architect	$69.03
Engineer	$70.97
Field Engineer	$80.86
Support	
Technician	$70.75
Technical Writer	$46.83
Draftsperson/CAD	$61.44
Cost Estimator	$70.97
Clerical	$38.08
Services	
Coverage Analyses, each site (includes labor)	$500.00
Simulcast Analysis, each cell (includes labor)	$500.00

Notes:

1. Rates are for calendar year 2000.
2. For work done after January 1, 2001, rates will escalate based on the IEEE-USA Salary Survey applicable to the most recent year surveyed. The 10 year average 1989-1999 was 4.9%.
3. Expenses will be billed at cost and travel will be billed in compliance with the VA travel code.

EQUIPMENT LIST

POWER METERS/WATT METERS

ITEM	MANUFACTURER	DESCRIPTION	QTY
75174	BIRD ELECTRONIC	WATTMETER	2
53089	BIRD ELECTRONIC	CARRY CASE	2
96605	BIRD ELECTRONIC	ELEMENT, 100-250 MHz, 25 W	2
66955	BIRD ELECTRONIC	ELEMENT, 100-250 MHz, 100 W	2
84115	BIRD ELECTRONIC	QUICK CHNGE CON. UHF-MALE	2

LOADS, ATTENUATORS, SIGNAL SAMPLERS

ITEM	MANUFACTURER	DESCRIPTION	QTY
49317	TELEWAVE	CONNECTOR, UHF-MALE	6
45823	EMR CORP.	CONNECTOR, N-FEMALE	2
79644	BIRD ELECTRONIC	FIELD STRENGTH METER	2

ITEM	MANUFACTURER	DESCRIPTION	QTY
39751	LP TECHNOLOGIES	W/ TRACKING GEN. AND AM/FM RECEIVER	2

ANTENNA TESTERS

ITEM	MANUFACTURER	DESCRIPTION	QTY
55765	HELPER INSTRUMNT	775 TO 1025 MHz W/RECHARGE. BATT.	2

GROUND RESISTANCE TESTER

ITEM	MANUFACTURER	DESCRIPTION	QTY
56338	AEMC	DIGITAL GROUND/SOIL TESTER KIT	2

SERVICE MONITORS

ITEM	MANUFACTURER	DESCRIPTION	QTY
23830	IFR	COM 120B-3T, W/ COVER AND BAIL	2
92098	IFR	AMPS MOBILE TEST OPTION	2
43715	IFR	IFR 500 W/ RECH.BATT.	0
64182	IFR	TELESCOPING ANTENNA FOR ABOVE UNITS	2
96243	IFR	HARD TRANSIT CASE FOR ITEM 23830	2

TEST CABLES/TOOLS

ITEM	MANUFACTURER	DESCRIPTION	QTY
67226	TESSCO	UHF/M-UHF/M	30
65977	TESSCO	N/M-N/M	30
49078	CELLDYNE	SITE ENGINEER'S TOOL KIT	2
71894	WOODS	100 FOOT EXTENSION CORD	2

ITEM	MANUFACTURER	DESCRIPTION	QTY
97328	WAVETEK	ST75 "MINI-STICK" AUTORANGING	2

FREQUENCY COUNTERS

ITEM	MANUFACTURER	DESCRIPTION	QTY
61401	OPTOELECTRONICS	MICROPROCESSOR BASED W/ DIG.COUNTER	2
53448	OPTOELECTRONICS	CARRY CASE FOR ABOVE	2
95695	OPTOELECTRONICS	TELESCOPING ANTENNA	2

RECEIVER ALIGNMENT INSTRUMENTS

ITEM	MANUFACTURER	DESCRIPTION	QTY
40053	HELPER INSTRUMENT	SINAD METER, 0-20dB, 120 VOLT	0
13625	HELPER INSTRUMENT	SINAD METER, 0-32dB W/TONE GEN., 120 VOLT	2

MICROWAVE TEST EQUIPMENT

ITEM	MANUFACTURER	DESCRIPTION	QTY
80872	UTICA	TORQUE SCREWDRIVER	2

HEWLITT PACKARD MW TEST EQUIPMENT

ITEM	MANUFACTURER	DESCRIPTION	QTY
HP	HEWLITT PACKARD	FREQUENCY COUNTER	0
HP	HEWLITT PACKARD	BIT ERROR RATE TEST TEST	2
HP	HEWLITT PACKARD	POWER METER	0
HP	HEWLITT PACKARD	OSCILLOSCOPE	2
HP	HEWLITT PACKARD	TIMS	2
HP	HEWLITT PACKARD	SIGNAL GENERATOR	0
HP	HEWLITT PACKARD	ATTENUATORS	0